Milwaukee 'Spot' Car Repair

. . . page 32

Radio Controlled Locomotive

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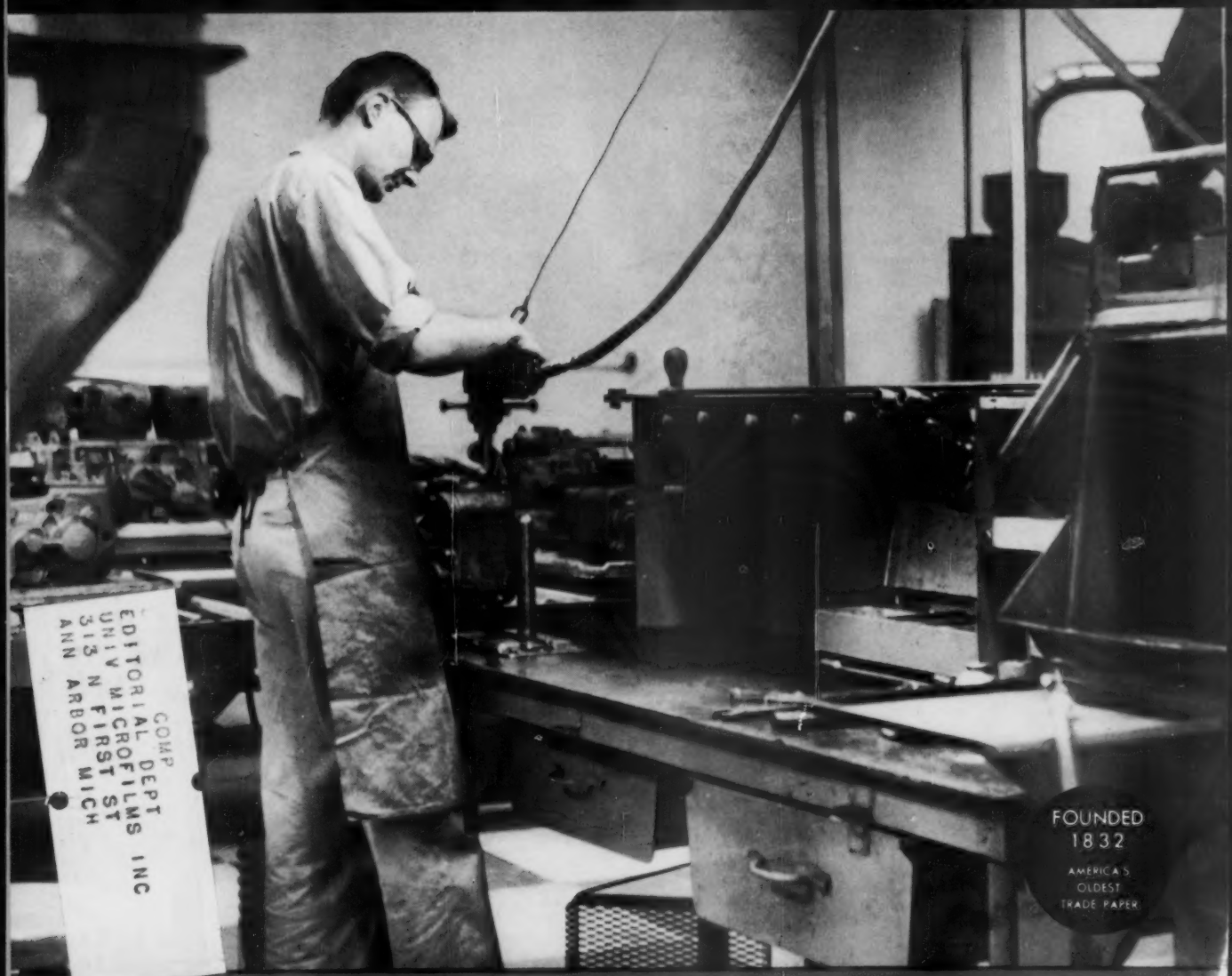
RAILWAY
LOCOMOTIVES AND CARS
FEBRUARY 1961



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Great Northern 'Streamlines' Brake Overhaul . . . page 17

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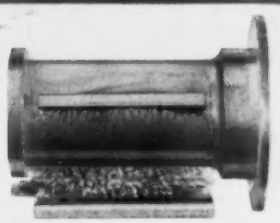

Design assures full length journal contact.

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*With the lubricator in position in the journal box, there is a wedge-shaped "pocket" on each side between the felt base and the pad where dirt is deposited. Action of the tufts on either side of the journal tends to shake away particles of loose dirt from the lubricator and into the pocket.

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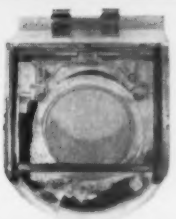
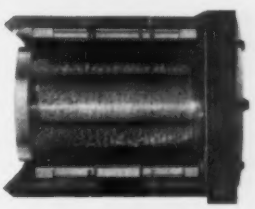


Excellent journal contact is maintained with the lubricator in any position, even at maximum displacement with no ribs present.



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REPORT FOR FEBRUARY

Allied Will Exhibit During Coordinated Meetings

Exhibits will be held by the Allied Railway Supply Association in conjunction with next September's Coordinated Mechanical Associations meetings in Chicago. This decision was the result of a ballot of ARSA members taken following the cancellation of the 1961 meeting of the AAR Purchases and Stores Division which was scheduled to be held immediately after the three-day session of the Coordinated groups. Proposal to hold the exhibit won by an "overwhelming majority."

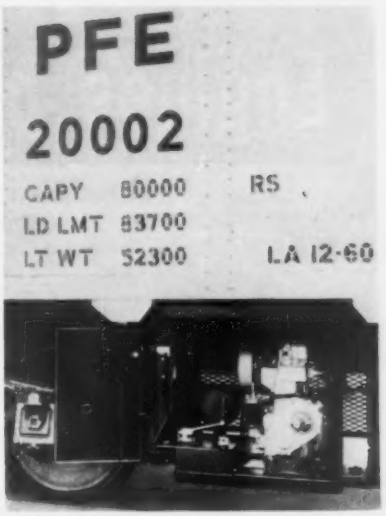
While original plans called for a five-day exhibit, new plans will have the displays coincide with the Coordinated meetings on September 11, 12, and 13. Coordinated Associations—Air Brake, Car Department Officers, Locomotive Maintenance Officers, and Railway Fuel and Operating Officers—will meet in the Hotel Sherman as they have in the past.

The ARSA exhibits will be held in the Hotel Sherman and at a track location on the Illinois Central. This track exhibit will be in the IC 31st Street yards where 5,000 ft of track space will be available. Free bus transportation will be provided between the Sherman and the IC yard on a regular schedule

PFE Rebuilds Have 'Ice-Tempco' System

Pacific Fruit Express is now equipping 500 ice-bunker refrigerator cars with its Ice-Tempco constantly operating, air-circulating fan system. This is the Cargotemp automatic temperature control system developed by Preco, Inc. (RL&C, May 1958, p 18). Installations are being made in PFE's car shops at Los Angeles, Calif, in conjunction with general repairs to the cars.

The modified cars, to be known as Ice-Tempco cars, are 40-ft ice-bunker cars with 4 in. of insulation. One ice bunker will be removed from each car and the remaining bunker enlarged to hold in excess of 7,000 lb of ice, increasing cubical loading capacity by about 10%.



Undercar diesel-alternator and 50-gal fuel tank are features of Ice-Tempco installation.

A 5-hp diesel alternator is installed under each car, along with a tank holding a 15-day fuel supply. The generating plant operates the four fans in the bunker end of the car, one serving as a "circulating fan" and the other three serving as "cooling fans." The circulating fan operates continuously and pulls air from the lading space up through a by-pass duct in the bunker bulkhead. Cooling fans operate at a fixed speed until temperature of air in contact with the thermostat in the bunker by-pass duct has

(Continued on page 43)

TIME SAVING IDEAS FOR FEBRUARY

MOTIVE POWER AND CAR

Loop Conveyor Speeds AB Valve Repairs 17
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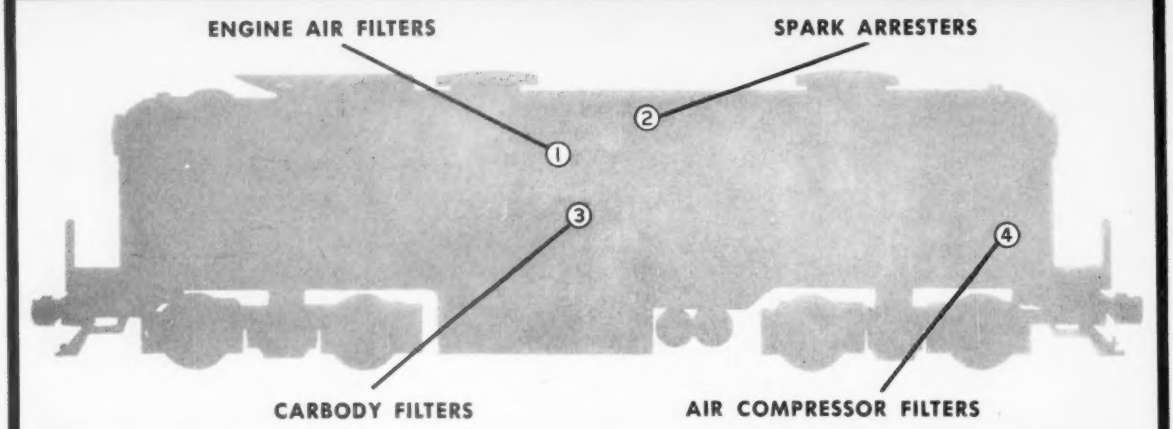

Whether you or the manufacturer rebuilds your locomotives, be sure to specify and use Air-Maze filtration products. Thirty-five years of filtration experience assures the Railroad Industry of maximum performance.

The following are examples of the variety of Air-Maze filtration products for diesel locomotives

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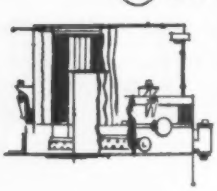
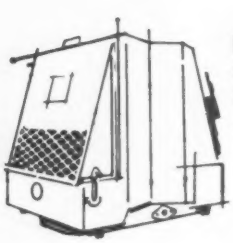


OIL BATH filter removes up to 97% of objectionable dirt . . . requires only semi-annual oil changes and annual cleaning.



PANELBATH filter replaces and upgrades oil wetted and centrifugal panel filters . . provides effective dirt removal . . low initial cost . . simple to install.

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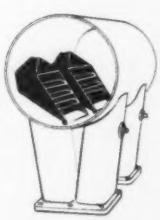
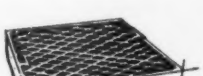
(2) SPARK ARRESTERS



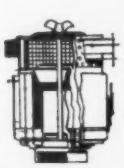
Designed for EMD and EM manifolds . . . utilizes principle of centrifuging incandescent particles to reduce particle size prior to leaving exhaust stack.

(3) CARBODY FILTERS



Designed to filter effectively . . . rugged construction assures long life.

(4) AIR COMPRESSOR FILTERS



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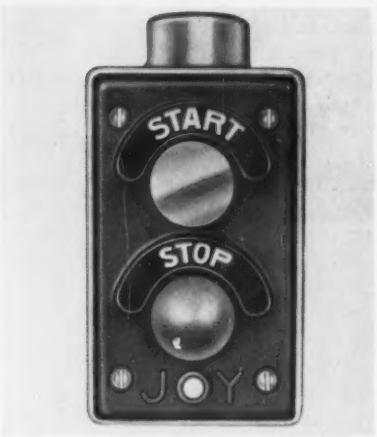


Push-Button Station

The Flexitite switch is a heavy duty push-button station of corrosion-proof, all-rubber, weather-sealed construction. It is recommended for any two-station push-button application, such as start-stop, up-down, forward-reverse, off-on, etc., and fits all standard FS and FD boxes. It meets NEMA types 1, 4 and 5 enclosure requirements. *Joy Manufacturing Co., Electrical Products Division, Dept. RLC, 1201 Macklind ave., St. Louis 10, Mo.*

Insulation Panels

Urefoam insulation panels of rigid foamed polyurethane, with waterproof plywood faces and aluminum foil backs, are said to provide high thermal efficiency in the insulation of refrigerated trucks and railroad cars. The panels interlock for airtight construction. Shiplap joints give 6 in. of sealing surface between each panel. The panels have a "U" factor less than half that of conventional insulated structures and are impervious to air, preventing loss of refrigeration and accumulation of moisture. The panels are self-supporting. They are installed by floating the inner body in place without bolts, braces, or any other heat conductor running from the outer frame through the insulation. Floor panels are faced with ½ in. plywood to compensate for additional strain on floor. When in place, the panels are bound permanently and become an integral part of the body. Internal support members of special finishes can be added to the structure for special requirements. When properly installed, the panels conform with the AFDOUS code, which recommends zero or below as applied to frozen food transportation equipment.

Standard panels are 4 x 7 and 4 x 8 ft, and thicknesses, 3½ and 5¾ in. Facing material can be aluminum, stainless steel, reinforced fiber glass, or other specification, in addition to waterproofed plywood. *Urefoam Corp., Dept. RLC, Camden, N. J.*

Impactools

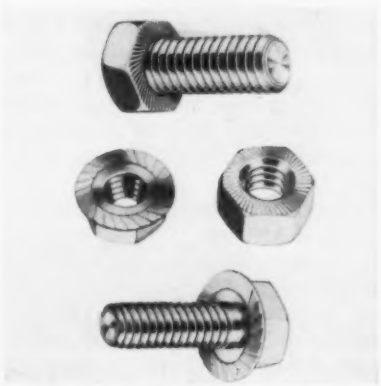
Snapping on a different pre-set torsion bar changes the torque delivered by either of two new torque-control Impactools. Each is available with heavy and light detachable torsion bars. The light torsion bar for the 5040TD tool may be set for torques from 20 to 50 ft-lb, while the heavy torsion bar covers from 45 to 90 ft-lb, giving a range of 20 to 90 ft-lb. For the 5020TD tool, bars may be set for 6 to 17 ft-lb and 10 to 30 ft-lb, covering a range of 6 to 30 ft-lb. Both tools shut off automatically when the pre-set torque of the torsion bar in use is reached. Size 5020TD is 11 in long and weighs 4 3/16 lb with torsion bar. Size 5040-TD is 12⅞ in. long and weighs 7 lb. *Ingersoll-Rand Co., Dept. RLC, 11 Broadway, New York 4.*

Plastic Coating for Car Journals

Savings of 30 to 50 cents each in the cost of cleaning freight-car journals are said to be possible through the use of Freight Liner Plasta-Gard, an all-weather strippable plastic coating. The plastic can be brushed or sprayed onto journals, diesel valves, drive shafts, and other machined metal surfaces needing protection against rust and corrosion. The material is said to stay flexible and strippable permanently and peel off easily even after long exposure to sub-zero cold or intense sunlight. It can be applied at any temperature, two coats drying to touch in 5 to 10 min. One gallon gives two-coat protection for about 60 journals. *Freight Liner Dept., Archer-Daniels-Midland Co., Dept. RLC, 732 Investors Bldg., Minneapolis 2, Minn.*

Cold Tank Concentrated Stripper

Stripzit is a heavy duty, single-phase stripper composed of 100% active ingredients designed to strip the hardest deposits from all metals, including aluminum and magnesium. It is said to be completely effective for quick, safe cleaning of carburetors, rings, pistons, fuel pumps, cylinder heads and small tools, and for stripping paint guns. It is useful as a fuel tank desealant and for circulating in pipelines to remove carbon sludge and heavy baked-on residues. *Sea-Air Chemical Corp., Dept. RLC, 32-00 Borden ave., Long Island City 1, N. Y.*



Locking Screws and Nuts

The Whiz-Lock, according to the manufacturer, has the easy spin-on application of the common nut and gives uniform tension throughout an assembly. The bearing face both of the screw and the nut has a series of spiral serrations on a convex base that takes a firm grip when the nut is tightened. Up to 50% more effort, it is said, is needed to remove a Whiz-Lock than is needed to apply it. A flange nut or flange screw can be specified for oversized holes where bearing surface is limited. *MacLean-Fogg Lock Nut Co., Dept. RLC, 5535 W. Wolcott ave., Chicago 40.*

EDITORIALS

Calamity or Opportunity?

The curtailment of Association of American Railroads activities was necessitated by lack of money to support them. This will cause many hardships, among which the curtailment of research work is particularly unfortunate. With the reduction of personal contacts made when groups get together, some of the advantages which come from exchange of ideas will be lost. Fortunately, the Coordinated Mechanical Associations will continue to get together and will carry on with the immediate needs of current mechanical department operating and maintenance requirements.

The Electrical Section was disbanded, and some of its members are inclined to consider it as a calamity. For years they worked to build it into a well-planned organization which did much good work. "Now," they say, "we are back where we started." That raises the questions—where did they start, where are they now, and where can they go?

Back in 1908, before electric headlights were mandatory and oil headlights were used extensively, electricity on the railroads consisted for the most part of some very simple car lighting and a little shop power and light. Portable lights were largely kerosene torches. Even then there was need for some means of comparing notes and establishing practices. This need was met by the creation of an independent body organized as the Railway Car Lighting Engineers. In 1910 it was renamed the Association of Railway Electrical Engineers. In 1937 it became the Electrical Section of the Mechanical Division, AAR. In 1952, it combined with the Electrical Section of the Engineering Division to serve both divisions.

Now the Electrical Section has been dissolved and it is proposed that, so far as the mechanical departments are concerned, they function as a Committee on Electrical Equipment—Rolling Stock and, perhaps, in other capacities.

This does not provide for electrical men in the Engineering department. Some of its former members seeking greater unification, have suggested that all things electrical including signals and communications be combined. This would have some advantages, but it would introduce many complications and would tend to perpetuate a basic fault; namely that of complication. Electrical devices are used in all branches of railroading and the word electricity can no longer mark the point of cleavage. There is little similarity between an analog computer and a diesel locomotive generator.

It is logical for a man who has come up through the mechanical department to think in terms of things mechanical with the result that economic planning often receives secondary consideration. Making the thing work is of first importance. Somewhat similarly, electrical men are inclined to tout electrical means and equipment to the exclusion of other means which may be better suited to the circumstances. Also it becomes almost a habit to hide behind a mask of technique, when that is possible, to emphasize the importance of the electrical department.

Now we are going through a period of transition in which, for a brief period at least, the importance of departmental prestige, be it mechanical or electrical, should be of secondary importance. By and large, the railroads are on a spot, and the man who gives attention to the economics involved is the one of greatest value to his railroad and to himself.

Electrical equipment is now a major component in railroad operation and who is responsible for it is a matter of both training and personality. It is up to the one who wants position to accept broad responsibility. This for the present, leaves the requirements of interchange, standardization and development of practices out on a limb. Fortunately, the dissolved Electrical Section has left a heritage of valuable data. When the work of compiling more can be resumed, it will be done by those men, mechanical or electrical, who have survived the present and, we hope, temporary situation.

Why Not Mechanical?

Both the Coordinated Mechanical Associations' meetings and the Allied Railway Supply Association exhibits will be held in September.

While there had been no doubt about the associations' annual meetings, there was a question about the exhibits. These had been planned for the Coordinated Associations and the AAR Purchases and Stores Division during the same week in September. With the cancellation of the P&S meetings there was a possibility that the exhibits would be postponed. Now, as reported elsewhere in this issue, the exhibits will be held for the duration of the Coordinated meetings.

We believe the Coordinated Mechanical Associations meetings are both necessary and worthwhile. They serve a useful purpose. Yet we are disturbed about the cancellation of the AAR Mechanical Division's June meetings when we hear that meetings of other AAR Divisions will be held in 1961.

The decisions of no AAR division are more important than those of the Mechanical Division. Rules adopted by the membership of this division are mandatory for railway cars in interchange. These rules can, and frequently do, involve substantial financial committments.

We are not questioning the economy measures of the AAR when it asked each division to forego its 1961 annual meeting unless there were "overriding considerations." But we believe that such economy should not be practiced by its most important division when other divisions find good reasons to meet.

We are happy that the Coordinated Associations will gather in September to discuss maintenance measures so essential to the railroads' economy. We are unhappy indeed about the Mechanical Division's meeting cancellation when it may be the only one to do so. Discrimination of this kind doesn't make sense.

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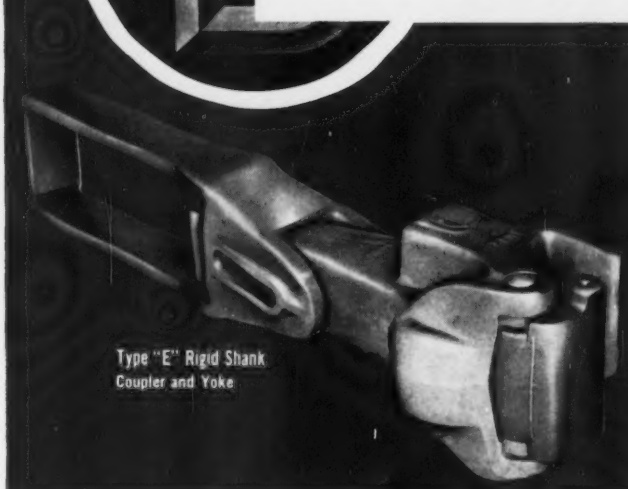

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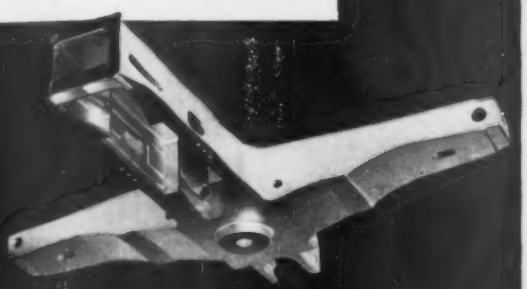
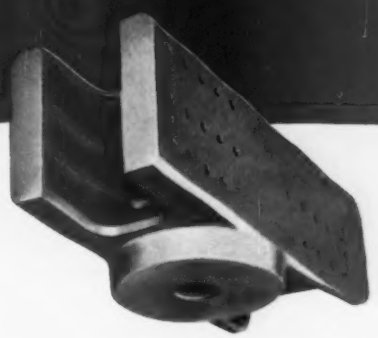


One Piece
Underframe End



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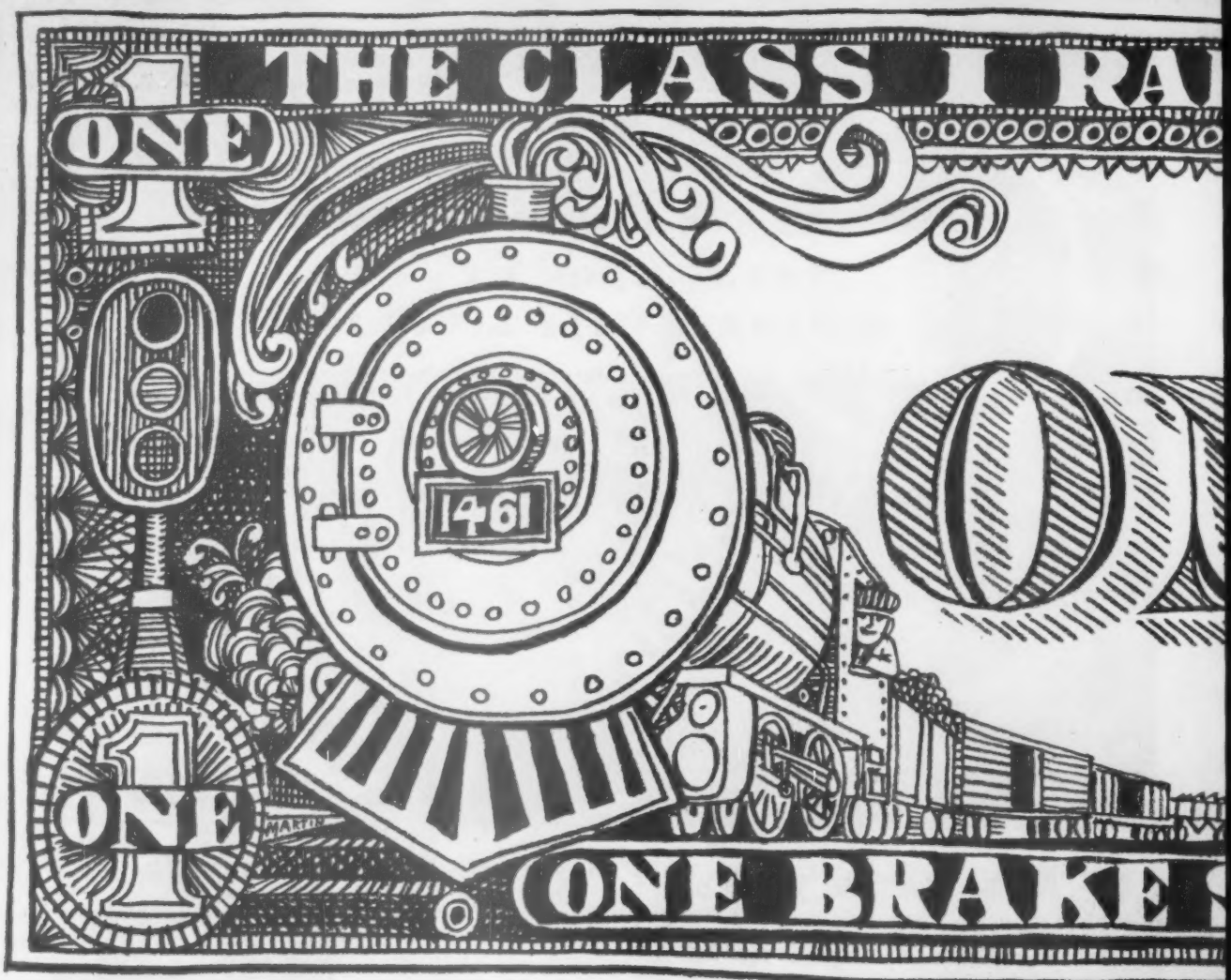

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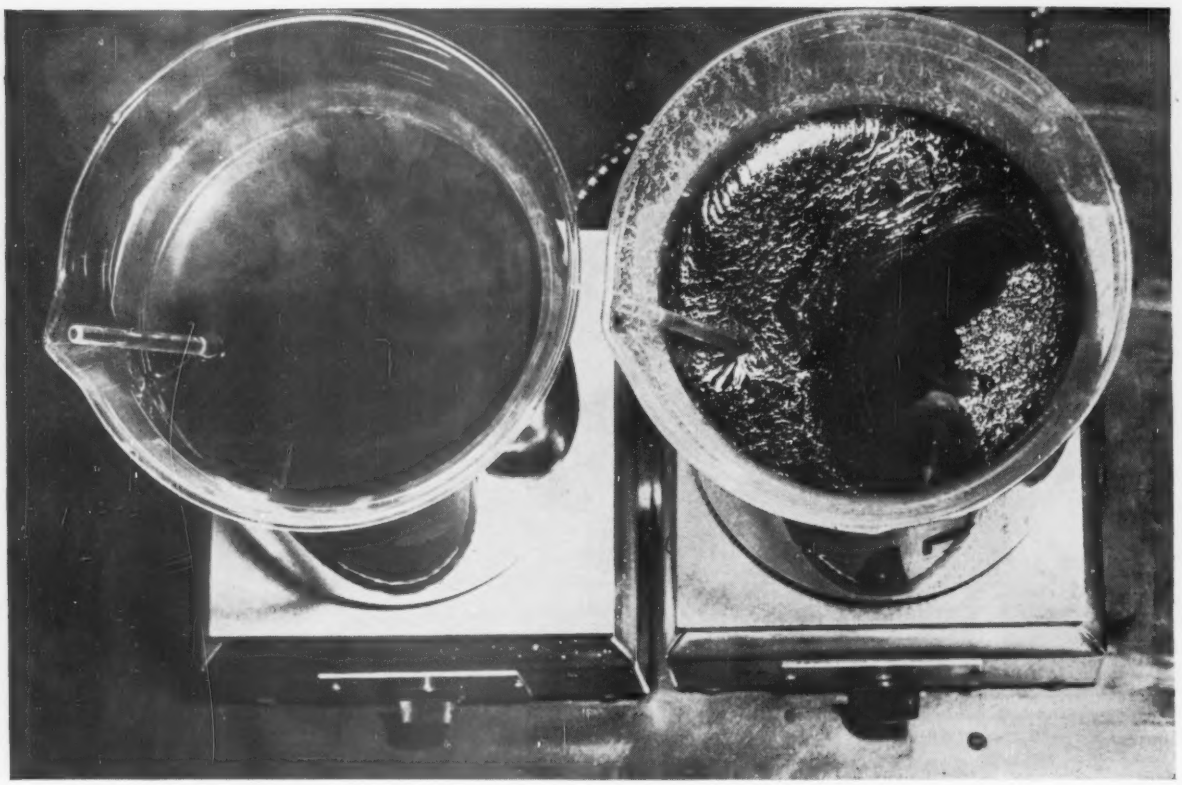

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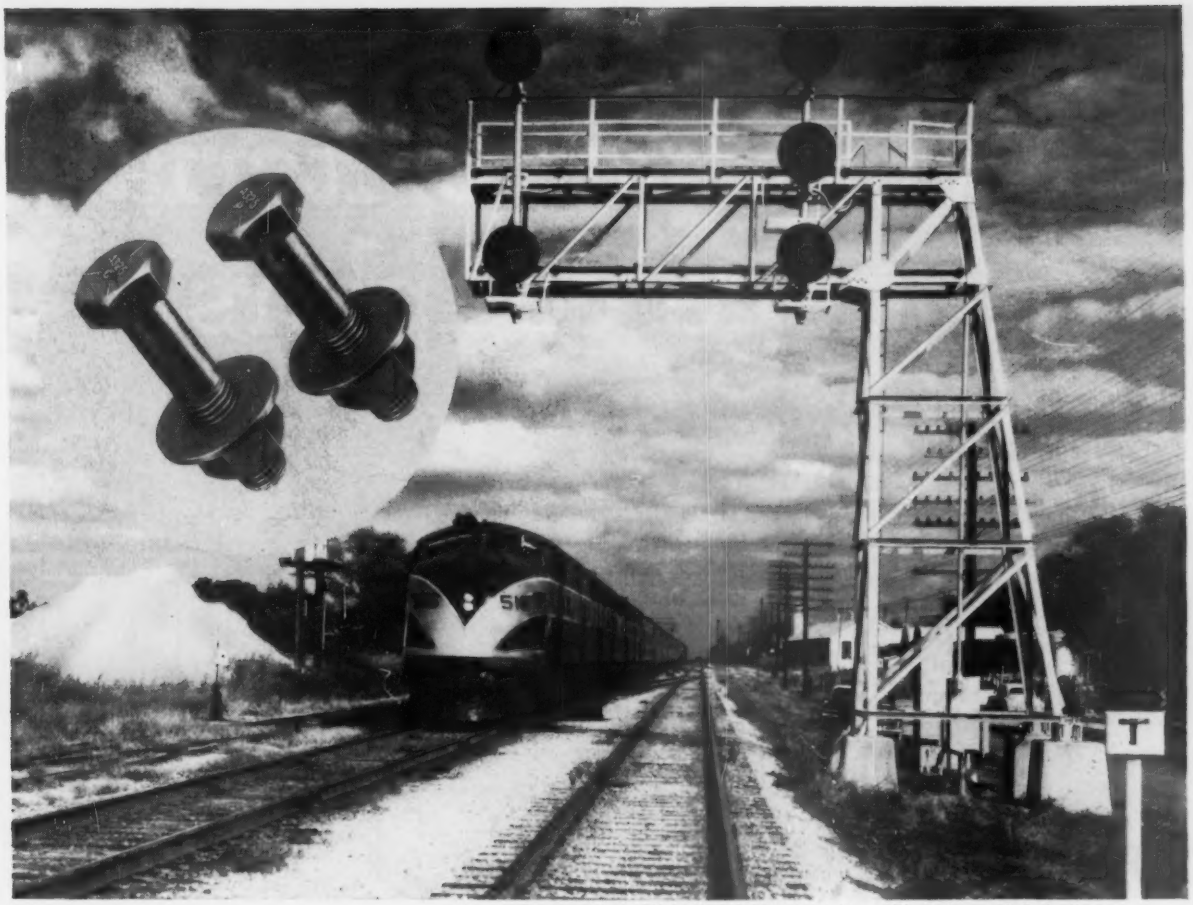

Photo courtesy of Union Switch & Signal Division of Westinghouse Air Brake Company

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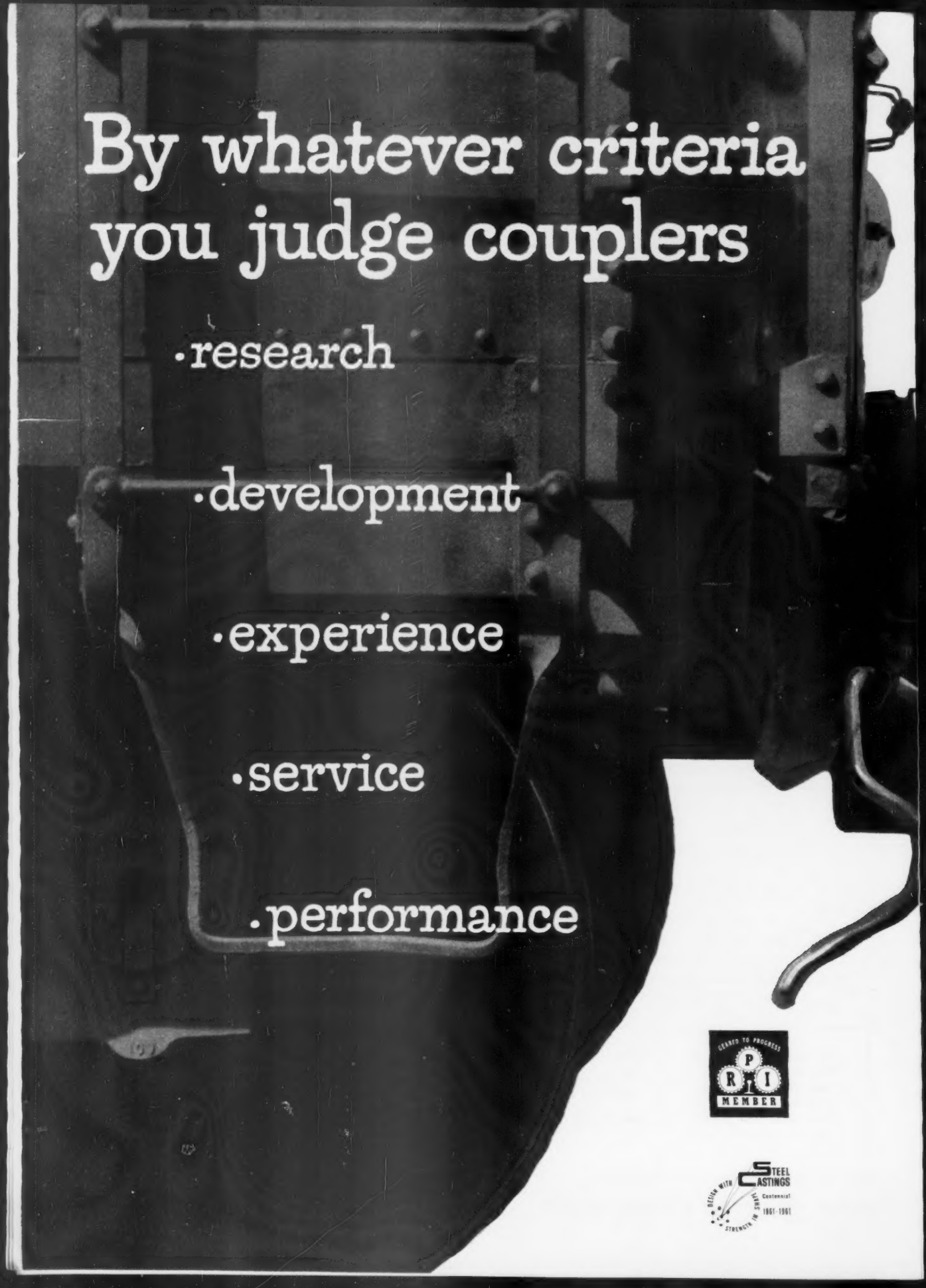
By whatever criteria you judge couplers
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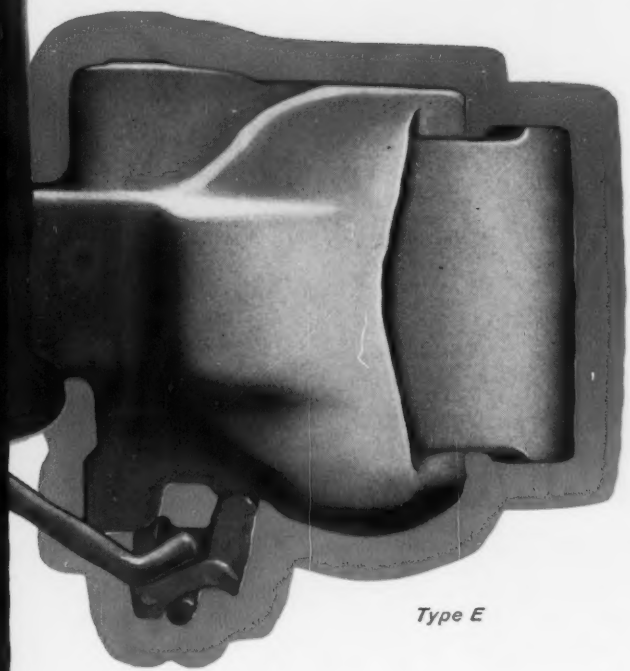

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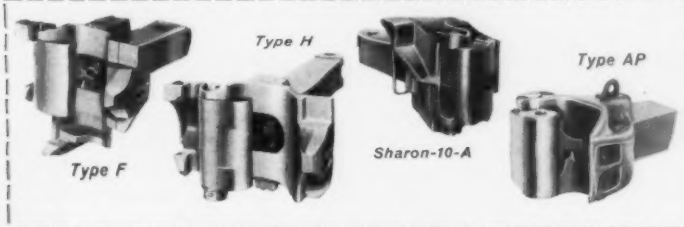

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STRONGER CAR BODIES are being built—and rebuilt—with RB&W High Strength Bolts in place of rivets. The reason: high strength bolts make joints *permanently tight*. It's been proved in mechanical shake tests (like the one being conducted above) and actual road service. The difference was dramatically demonstrated when:

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- On another road, a similar 70-ton hopper car was rebuilt, with half the underframe riveted . . . and the other half bolted with RB&W High Strength Bolts. Impact and shakeout test results were fine. Inspection after six months of service showed many rivets loosened—but all bolts still secure.

There's proof that bolts are better than rivets to *start* with. They're even more advantageous at repair time. Dismantling damaged members and reassembling is simply a matter of removing bolts and re-installing them. Compare that with the time for burning out rivets, then re-riveting. And bolting can be done on any repair track instead of in the shop.

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For Great Northern . . .

Loop Conveyor Speeds AB Valve Repair

Mechanization of its facilities for overhauling AB freight brake valves has been completed by the Great Northern. Valves for the entire system are to be handled at the Jackson Street Shop at St. Paul, Minn. Currently, some 90 to 100 emergency and service portions are cleaned, repaired, oiled, and tested each day on a single shift. GN officers expect an output of 12,000 to 14,000 overhauled valves per year when the line is in full operation.

All steps in the overhaul are centered around a pair of 105-ft belt-driven, live-roller conveyors, connected by two 180-deg curved sections, also powered, which form a complete loop. The conveyor moves clockwise continuously, completing one cycle in 17 min, traveling at 15 ft per min. There are 14 stations for cleaning, repair, and assembly on one side of the conveyor loop. Two ring repair stations and six AB test racks, three for service and three for emergency portions, are on the opposite side. Two lapping machines are located just beyond the last of the 14 repair stations. If any group of stations is filled with work when a valve requiring that operation comes by, the valve continues around the main loop until one of the operators is ready for it.

Overhaul Stations

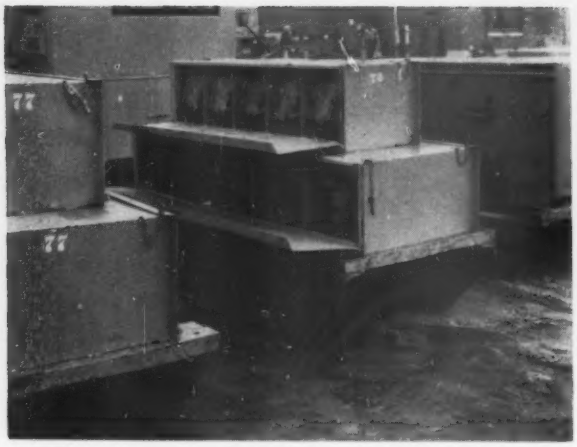
Each repair and assembly station has a short gravity section, or pull-off shelf, where a palletized part can be moved sideways from the conveyor without lifting. Under each shelf is a storage space for pallets. The conveyor can be stopped by pushbutton at any work station, and there is a master control at the head of line.

The line is operated by 25 carmen, including trainees. There are six test-rack operators, twelve cleaners and assemblers, two repairmen, one Lap-master operator, two ring repairmen, one shipper who cleans strainers and stencils and prepares valves for shipment, and one Wheelabrator attendant who also keeps the conveyor filled and repairs covers.

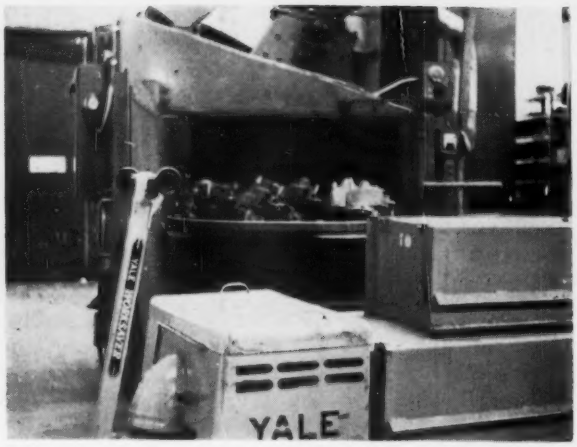
Shipment of valves to and from the shop is controlled by the Stores Department. Valves for cleaning and repair are handled in two-compartment steel containers. The upper section of this container holds ten emergency portions, and the lower section holds ten service portions. Upon delivery to the shop and prior to mechanical cleaning, the shipping covers on the valves are checked for tightness, and fitted sleeves are placed over the studs for protection. The valves, in groups of ten, are then placed with shipping covers down in a Wheelabrator abrasive type cleaning machine for a 5-min cleaning cycle. After cleaning, the shipping covers and strainers are removed and the individual valves loaded on 14-in. square wooden pallets. These pallets are placed on a combination live and gravity roller conveyor which terminates in a live-roller section which feeds the valves into the main conveyor loop. An automatic stop at the discharge end of the feeding conveyor is actuated by an electric eye. This photo-electric cell is on the main loop just before the junction. It gives the right-of-way to valves already on the main loop and opens the stop to release valves to the loop when space is available.

Valve position on the conveyor line indicates the work to be done. Valves removed from the Wheelabrator are set on edge to denote they are ready for disassembly and bench clean-

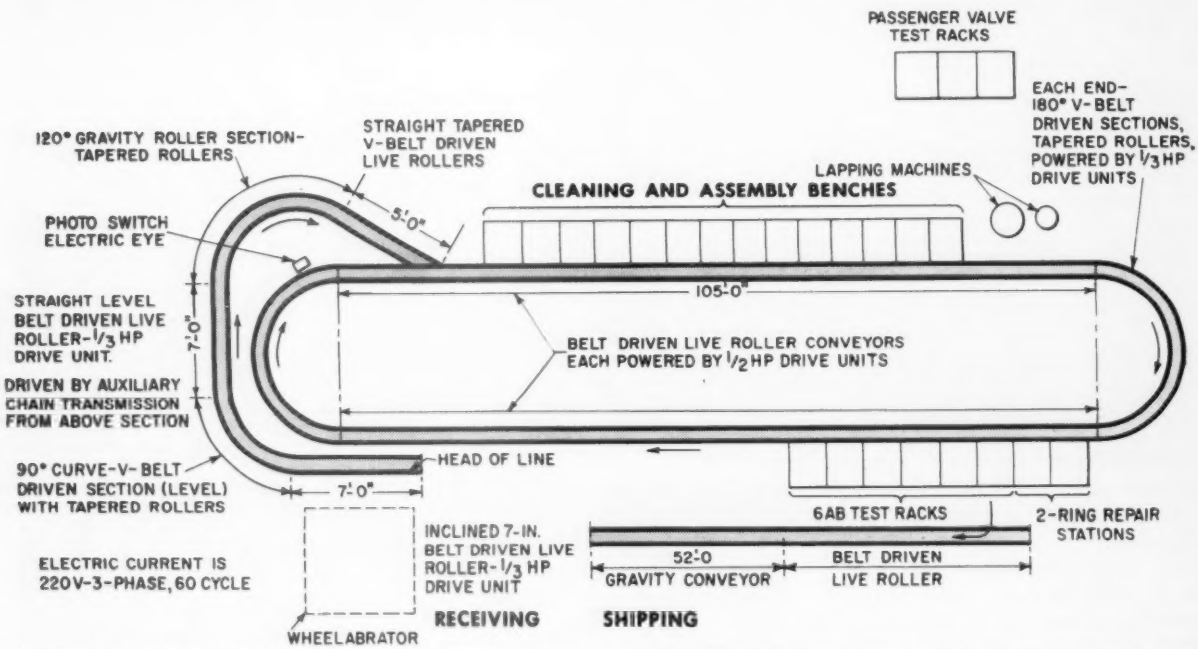
Brake valves continue to travel around conveyor loop until overhaul and test are completed. Dust collector is against far wall. Plans call for the shop to be fully air conditioned.



Shipping containers made at St. Cloud shop have individual compartments for holding 20 AB valve portions. Lift trucks handle them.



Portions can be unloaded from shipping containers directly into Wheelabrator machine for cleaning prior to going on conveyor loop.


PASSENGER VALVE TEST RACKS
EACH END- 180° V-BELT DRIVEN SECTIONS, TAPERED ROLLERS, POWERED BY 1/3 HP DRIVE UNITS
120° GRAVITY ROLLER SECTION- TAPERED ROLLERS
STRAIGHT TAPERED V-BELT DRIVEN LIVE ROLLERS
LAPPING MACHINES
CLEANING AND ASSEMBLY BENCHES
5'-0"
PHOTO SWITCH ELECTRIC EYE
105'-0"
STRAIGHT LEVEL BELT DRIVEN LIVE ROLLER- 1/3 HP DRIVE UNIT.
7'-0"
BELT DRIVEN LIVE ROLLER CONVEYORS EACH POWERED BY 1/2 HP DRIVE UNITS
DRIVEN BY AUXILIARY CHAIN TRANSMISSION FROM ABOVE SECTION
90° CURVE-V-BELT DRIVEN SECTION (LEVEL) WITH TAPERED ROLLERS
HEAD OF LINE
7'-0"
6AB TEST RACKS
2-RING REPAIR STATIONS
INCLINED 7-IN. BELT DRIVEN LIVE ROLLER- 1/3 HP DRIVE UNIT
52'-0 GRAVITY CONVEYOR
BELT DRIVEN LIVE ROLLER
ELECTRIC CURRENT IS 220V-3-PHASE, 60 CYCLE
RECEIVING
SHIPPING
WHEELABRATOR

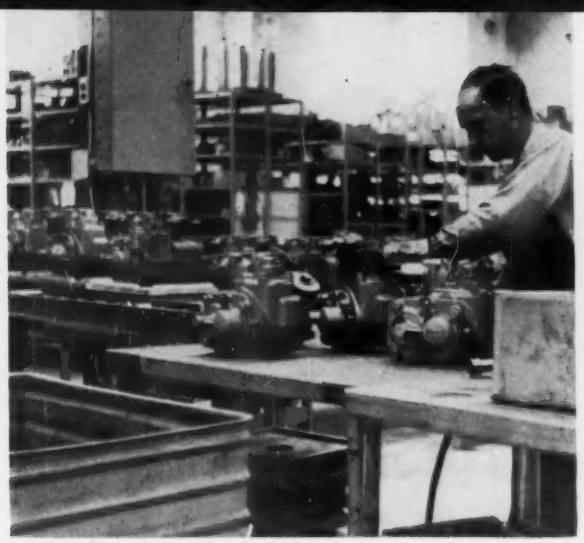
Operations are centered around the conveyor loop. Conveyor operation can be controlled from central panel and from stations along the lines. Incoming valves are delivered to the Wheelabrator cleaner at bottom and the overhauled valves travel on the lower conveyor from the test racks to the shipping position. Shop has been arranged to handle all the GN's brake-valve requirements.

ing. After cleaning and assembly, valves are laid bushings down to keep the interiors clean and to indicate they are ready for test. Tested valves which have been rejected because of defective slide or graduating valves or rings are chalk-marked *S*, *G*, or *R*, or a combination of these, and are returned to the line, again placed on edge. Valves marked *S* or *G* are removed at the lapping operation. New parts are applied when necessary. Valves marked to indicate ring work move to either of the ring repair stations. After repair and reassembly, the valves are again placed bushing down and returned to the test racks for checking in compliance with the AAR test code.

Valves passing the rack test are placed on individual pallets which move on a combination live and gravity roller conveyor to the shipping bench. The shipping cover, protector for release valves, and new or cleaned strainers for the pipe bracket are applied. The date is stencilled on the valve before it is returned to the shipping containers.

Each cleaning and assembly bench station has a stock of new or repaired parts provided by the Stores Department. Equipment includes an individual fluorescent light over the bench, impact wrenches, and an exhaust cleaning booth equipped with a separate light. Shop air is supplied at 110 psi. A combination of solvent and air is used with the cleaning guns. Each exhaust duct removes air and fumes at an 800-cfm rate and is operated with a foot pedal. Each AB test rack is equipped with a mechanical manometer instead of the conventional liquid type for testing release insuring

(*Continued on page 20*)



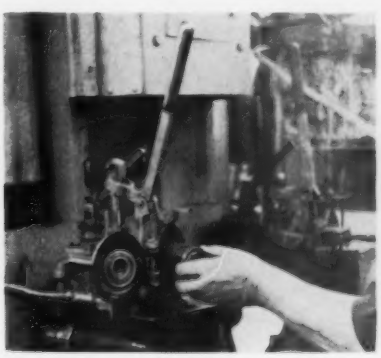
Valves removed from Wheelabrator are prepared for conveyor. They move on the wooden pallets which are stacked underneath bench.

Photoelectric cell (left center) on main conveyor loop controls feeding conveyor stop and regulates delivery of portions on main loop.

Valves on main conveyor loop are turned face down on pallets when they are ready for test. Those on edge are to be taken off at one of the cleaning and repair stations for overhauling.

Each of 14 overhaul stations has hood connected to the overhead exhaust system. Bench is stocked with repair parts and with spray nozzles supplying compressed air and solvent.

Valves which pass AB test racks (right) are moved on separate conveyor to shipping area.



Air strainers are cleaned in a special device which has been installed for the operation.

Protector is applied to the release valve as part of the preparation for shipment.

valves in service portions; a Flowrator is used at each bench for ring leakage tests. While service and emergency portions can be run concurrently on the loop, present practice is to process lots of about 100 of a single type to simplify lapping operations.

Overhead fluorescent lights provide 40 foot-candles at the repair stations. With the individual bench lights giving an additional 10 foot-candles, shadows in work areas are eliminated. Air conditioning is to be installed this year. There will then be a complete change of filtered air each 15 min.

Three test racks in a separate line are available for testing passenger valves, which are individually repaired. When needed, one Lapmaster is assigned for lapping the internal portions and the slides for these valves. During winter, when demand may be great, repaired passenger valves are stored in racks along one side of the cleaning room and are shipped on a unit exchange basis. Passenger valves with unserviceable bushings are dismantled. Bodies are sent to Dale Street shop, St. Paul, Minn., for new or rebored bushings. Currently, AB valves with unserviceable bushings are sent to New York Air Brake Company for repairs.

Windjammer Cleans AT&SF Coaches

High velocity air cleaners are now cleaning coaches and diesel locomotives on the Santa Fe. Three of the units are in use at the Chicago coach yard and five each in the locomotive shops at Argentine, Kan., and Barstow, Cal. First of these devices was put into use in September 1960. They have since proved so successful that their use has expanded rapidly.

The device, known as the Windjammer, was developed jointly by the Santa Fe and the Farr Co. Each unit contains two 24-in. fans which operate at 1,850 rpm and pull 33,000 cfm from the car or locomotive undergoing cleaning. Fans are powered by two 5-hp motors.

At the 21st Street coach yard in Chicago two of the devices are designed for cleaning conventional cars and one for the Sante Fe's Hi-Level El Capitan coaches. Coaches are normally cleaned in pairs by placing the cleaner against a vestibule side door between the two, with all the end doors blocked open. Head rest covers and heavy refuse are removed by hand. A cleaner with an 80-psi air line then works toward the fan ends of the cars, dislodging all refuse into the air stream induced by the high-capacity fan. Seats, carpets, radiators, and luggage racks are all blown to lift dirt and dust. Normal trip cleaning takes 10 to 15 min. per car. Extremely dirty cars are given a 1-hr cleaning by two men. Carpets are cleaned so effectively that they are now removed for washing annually, instead of quarterly, and air-conditioning ducts and coils can be cleaned annually also.

At locomotive shops the conventional blowing of generators, motors and high-voltage cabinets has been replaced by a system which uses one of the Windjammers against a carbody door. The former system only served to move the dirt from one place to another, not to remove it. Now one man loosens this dirt and the suction device draws it outside. The cleaner also has proved effective in removing solvent fumes produced while cleaning the interiors of locomotive carbodies. Cleaning formerly could not be continuous because of fume concentration.

Mobile suction device pulls air through cars, entrapping air-borne dirt and trash in high-velocity stream. Trash gathers in rear of unit, from where it is subsequently removed.

Blowing of all interior surfaces and fabrics in car lifts dirt so it will be drawn out.

For Diesel Locomotive Applications . . .

Hydraulic Drives Have High Capacity

By Fritz Kugel

Hydraulic transmissions have been applied to diesel locomotives with increasingly higher horsepower ratings during the past few years. Present technology offers either the electrical or hydro-dynamic transmission for such high-power applications. Attitudes about the horsepower limits of these two types of transmissions have sometimes been based on the ratings of the majority of locomotives already in service. Because of the rapid development of higher power hydraulic transmissions, this may lead to unrealistic conclusions.

Over the past ten years diesel-hydraulic locomotives with ratings of 2,000 to 3,000 hp have been successfully operated on the German Federal Railroad, the British Railways, and others. Two U.S. lines—the Denver & Rio Grande Western and the Southern Pacific—have ordered a total of six 4,000-hp units, each equipped with two 2,000-hp Voith turbo transmissions (RL&C, March 1960, p 24; June 1960, p 35).

The 2,000-hp hydro-dynamic transmission is the latest and largest developed by J. M. Voith of West Germany for railroad service. More than 8,850 Voith transmissions—with an aggregate of 3,100,000 hp — have been supplied, or are on order, for use in locomotives and rail cars. They are all based on the same principles as the 2,000-hp units, although being lower powered.

With all power transmissions, the size — consequently, the weight and cost — increases with the horsepower rating and expected life. In the course of increasing the rating, not only the strength and wearing qualities must be retained, but the function and efficiency of the original design should not be changed. This can mean that the mechanical and thermal stresses must be pushed to their limits without adverse effects on performance.

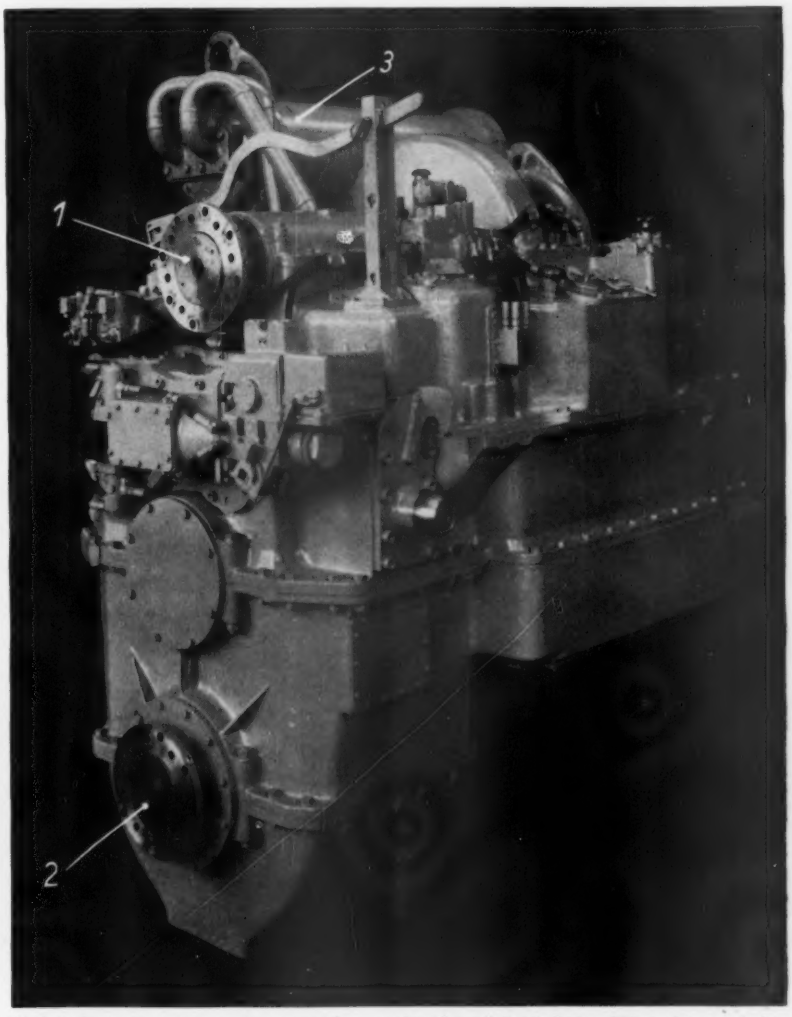
Necessary increases in dimensions and weights, when a power transmission design is enlarged to make it capable of handling higher input, can be calculated. Mechanical stresses in a hydro-dynamic transmission remain unchanged when a proved design of a given capacity and dimensions is enlarged to handle a higher input if the horsepower to be transmitted and the dimensions of the drive are related by the following formula:

$$N = \text{Constant} \times D^2$$

N is the horsepower, D is the reference diameter of any vital part of the transmission. All dimensions must remain geometrically similar when a given size of transmission is enlarged. The above formula assumes that the absolute peripheral speeds of the revolving parts are constant.

If hydro-dynamic transmission dimensions are increased according to formula, thermal stresses remain unchanged. The losses, which are manifested as heat, are proportional to output and can be dissipated under the same temperature conditions, because there will be a proportional increase in the volume of circulating oil.

If it is assumed that peripheral speed and the horsepower per square



Voith turbo transmission receives power from engine through input flange (1) and is coupled to trucks by output flange (2). Heat exchanger (3) is mounted atop the transmission housing.

Mr. Kugel, VDI, is director, transmission division, J. M. Voith, GmbH, Heidenheim, West Germany. Voith is a designer and builder of hydraulic transmissions for railroad applications.

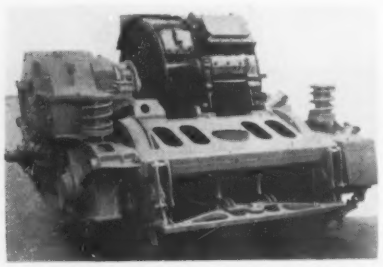
inch of rotor surface are constant in an electric power transmission, the relationship between horsepower and dimensions would be the same as for the hydraulic transmission. It will be found that the mechanical stress relations are very similar to those in hydraulic power transmissions. This is not the case when thermal stresses are considered.

When a given electric machine is geometrically enlarged, the external surfaces will increase in direct proportion to the heat losses. However, paths for the transmission of the heat to these external surfaces will be lengthened at the same rate. A higher temperature differential would be required to force the same quantity of heat per square inch of surface through this longer path. If external surface temperature is to be maintained, temperatures inside the machine—in the windings, for instance—must be higher. If the heat cannot be dissipated as readily when horsepower input increases, dimensions must be increased more than would be indicated by the above relationship.

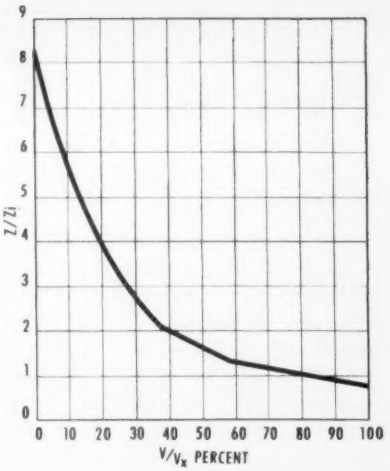
Thermal conditions do constitute a serious "bottleneck" for electric transmissions. Heat losses of the electric transmission must be dissipated from the insulated and embedded windings by volumes of cooling air delivered by the traction-motor blowers. Because more heat is developed during starting and at low speeds, short-time current limitations are frequently imposed.

Transmission oil, the working fluid, removes the heat generated by losses in hydraulic transmissions. The high specific heat of this oil makes it effective both as a heat carrier and heat accumulator. In the transmission heat exchanger, this oil is cooled by the diesel-engine cooling-water system. Maximum ratings of hydro-dynamic transmissions can be at least equivalent to those of their electric counterparts.

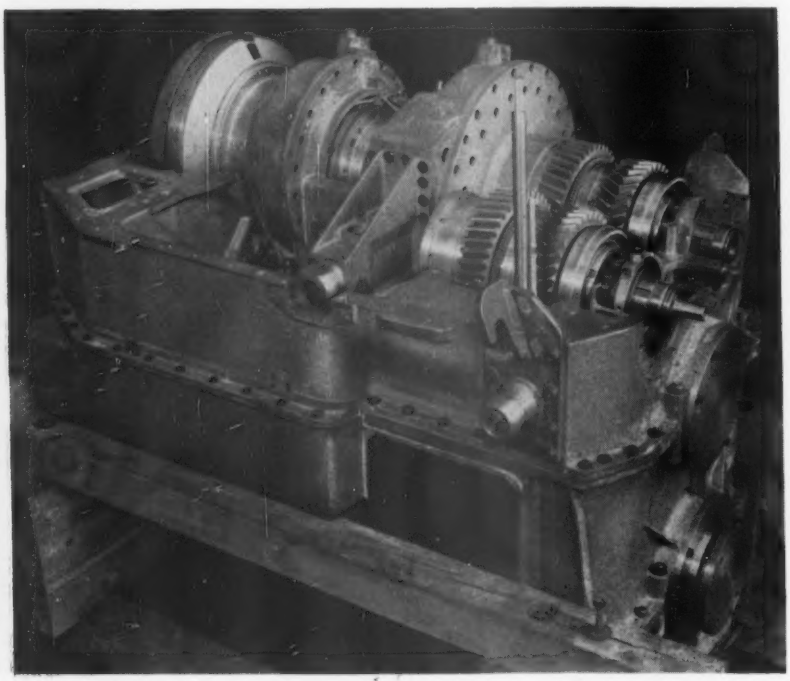
Space and weight limitations can have an important bearing on the design of transmission for diesel locomotives. Because the generator and motors of the electric transmission are separated, this transmission is inherently heavier than a comparable hydraulic transmission. If the total weight of the locomotive exceeds the adhesion weight required for a traction job, excess weight can detract from overall efficiency. This can be particularly important when grades are to be negotiated.



Single-motor truck of this basic design is under several types of French electric locomotives. Gearing one motor to both axles is said to improve adhesion characteristics.



Speed and tractive-effort curve for three-converter turbo transmission shows that range changes can be accomplished smoothly. Tractive effort is represented by Z/Zi; speed by V/Vx. Tractive effort (kg) is calculated from formula $Z = (Z/Zi) \times Zi$, in which $Zi = (N \times Vx) / 270$. N is metric horsepower; Vx maximum speed in km/hr.



Voith transmission with top portion removed shows the mounting of gearing and converters on shaft. Moving parts are immersed in oil, resulting in low wear, according to the author. Gearing operated at standstill produces dual-service locomotive.

Axle Drives

Even when it is admitted that the hydraulic transmission is practical, doubts are frequently expressed about the transmission of power to the locomotive axles.

Both mechanical and hydraulic transmissions do require a mechanical linkage with the driving axles. This, it is sometimes claimed, can be a source of difficulties. Although it may be conceded that jack-shafts and side rods on low-speed, rigid-frame locomotives work satisfactorily, there is doubt about the gears and cardan shafts used on high-power, high-speed locomotives.

Rigid coupling of several axles was not considered objectionable on steam locomotives. Connecting the axles of an electric-motor-driven truck has, at times, been regarded as advantageous. This can make possible the use of a single traction motor geared to both axles, with resultant weight savings.

(*Continued on page 30*)

SAFE WITH SERVOSAFE®

Experience counts when you're talking about hot box detection

Railroad Products Division Chief Technical Advisor William Pelino (left) discusses details of the SERVOSAFE® Hot Box Detective system at trackside with Frank R. Woolford, Chief Engineer of the Western Pacific. Electronic engineer Pelino has removed the housing to show how infrared scanner employs patented "slant-aspect viewing" method to focus on optimum trailing edge of passing journal box.

No one understands real experience better than a railroadman. It's the incomparable knowledge, skill, technique, and judgment that comes only through being actively engaged in a particular kind of work for an extended length of time.

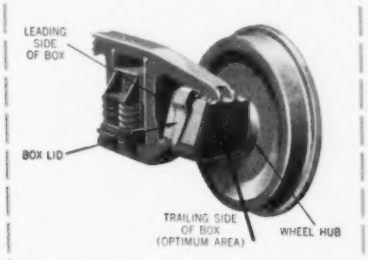
In evaluating modern hot box detection systems, railroad veterans naturally have high regard for Servo Corporation of America. Understandably so. Pioneers early in 1952 of the SERVOSAFE® Hot Box Detective* system, Servo's Railroad Products Division can speak with the authority of experience.

Substantiating this confidence is the experience of 28 major Class I railroads on which several hundred patented Detective systems have amassed approximately *3 million hours* of successful operation over the past 4 years. What finer tribute and testimonial!

"There's no substitute for experience," it has been said with wisdom. This maxim holds especially true when you're talking about something as important as the *hot box*, and the best way to *detect* it.

Naturally, any railroad signaling and communications system such as the Hot Box Detective requires unusual knowledge, skill, and judgment in its application. With eight years of application engineering behind them, right at trackside, Servo railroad electronic specialists can make expert recommendations as to which of the *six* successfully operating SERVOSAFE systems should be installed at particular sites on particular roads. They can suggest best locations for scanners, recorders, hot box locators, and automatic alarms to provide peak efficiency and greatest operating flexibility and convenience.

Be safe with SERVOSAFE. Just give your experienced Servo man a call.



TRAILING EDGE SHOWS HOT BOX BEST

Tests conducted by a major Eastern railroad prove that the trailing edge of the journal box presents the optimum accessible area for hot box inspection. Presenting a low-mass path of thermal flux from the bearing, this spot responds most rapidly to bearing temperature changes. The SERVOSAFE® "slant-aspect viewing" method of scanning this optimum area is protected by Servo patents both in the U.S. and abroad. Hot boxes—as well as developing hot boxes—can best be detected the SERVOSAFE way.

**Protected under one or more of the following U.S. Patent Nos.: 2,880,309, 2,947,857 and 2,963,575. Other U.S. and foreign patents pending.*

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Railroad Products Division | SERVOSAFE® HOT BOX DETECTIVE* SYSTEMS
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Electronic specialists to the nation's railroads • Sales and service centers coast to coast

FOOTNOTE FACTS:

Efficiency— SERVOSAFE roads report better than 90 per cent efficiency...in some cases as high as 100 per cent for consecutive periods over six months.

Savings— One road reports savings of over $100,000 per installation per year, allowing amortization of the equipment in approximately one month.

New patent— Patent No. 2,963,575 covering automatic alarm hot box detection devices was issued to Servo Corporation of America on Dec. 6, 1960. Granting of this latest patent now protects with three patents various infrared detection systems pioneered and marketed by Servo Corp.

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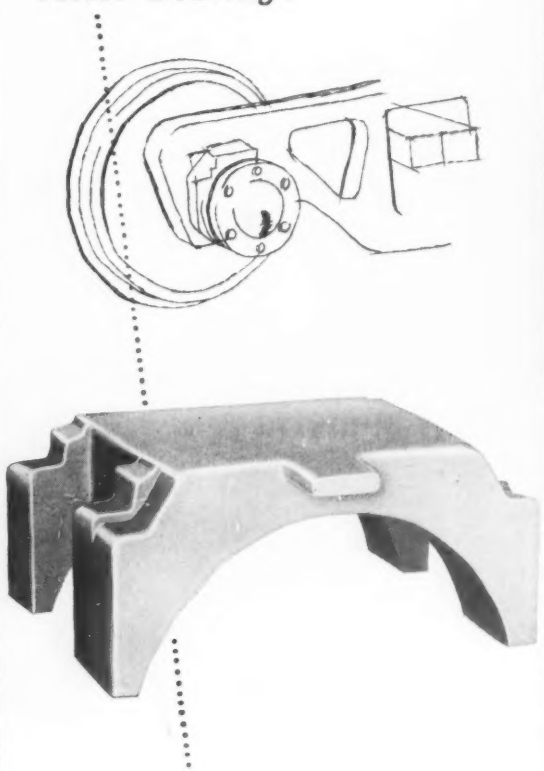

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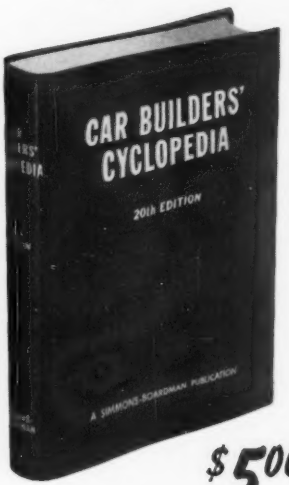

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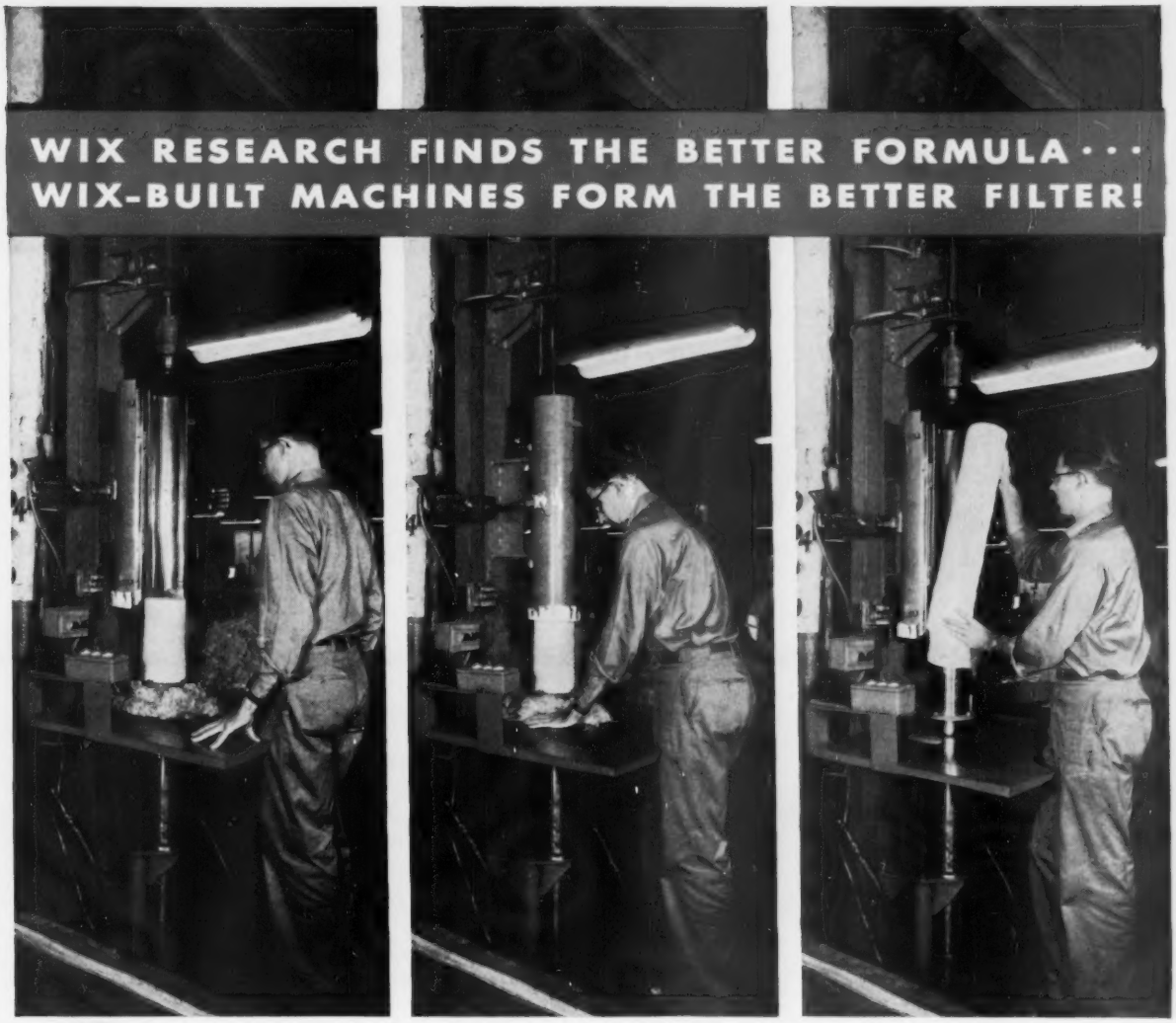

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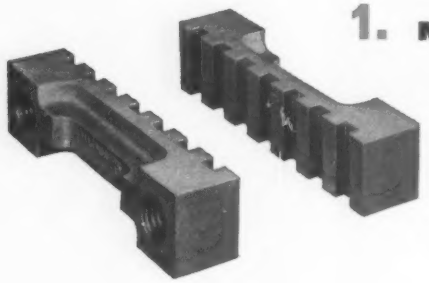

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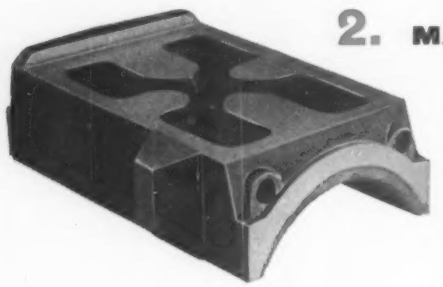
Provide maximum stabilization of the entire journal box assembly—increase miles per hot box ten times



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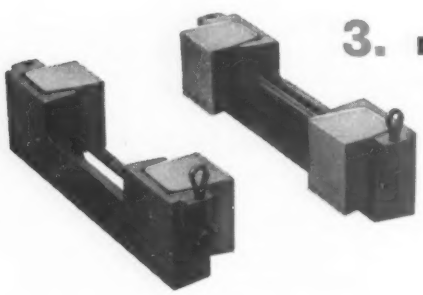

3. MAGSTOPS

Offer the inherent advantages of R-S Journal Stops in a low-cost, rugged, fabricated design

THE NEXT big step toward better bearing performance will be the adoption of effective means of stabilizing the journal assembly—for this is the most economical way to reduce hot boxes. Magnus, the pioneer in journal stabilization, now offers you *three ways* to achieve this result at low cost. All have been approved by the AAR for test installations in interchange service. Ask your Magnus representative to discuss with you the most effective solution to this problem. Or write to Magnus Metal Corporation, 111 Broadway, New York 4, or 80 E. Jackson Blvd., Chicago.

JOURNALS—

get BETTER BEARING PERFORMANCE

Bolted to the inside of the box, on both sides of the journal, Magnus R-S Journal Stops positively prevent excessive displacement of bearing, wedge or lubricator pad, even under severe humping, braking or road impacts. By stabilizing the entire journal bearing assembly they eliminate the major causes of bearing failures —increase miles per hot box *ten times;* miles per cut journal, *fifteen times!* In short, they cut maintenance and operating costs all along the line—double bearing and dust guard life, reduce wheel flange wear, extend the maximum safe period between repacks.

Journal Stops give the low-cost solid bearing a chance to work at optimum efficiency, not just part of the time, but *all* of the time! They can be easily installed on any freight car, new or old. And they increase new car costs less than 2%—*pay for themselves* in less than 3 years!

Wear on R-S Journal Stops is slight, and Stops can be re-shimmed should wear become excessive. The Stops should last the life of the side frame.

The Magnus flat-back bearing design provides the most economical means of stabilizing the journal box assembly, and has proved highly effective for many types of service. Its greater width, increased angle of journal contact and full-area contact with the flat wedge inherently limit the fore-and-aft movement of the journal within the box under road shocks and switching impacts. This restriction of movement protects the dust guard, tends to prevent spread linings in the bearings.

The flat-back bearing is also manufactured to "pre-war length," increasing resistance to impact and wear at both collar and fillet ends. Its greater mass and weight result in a more *rugged* bearing with inherently greater life expectancy.

Magnus flat-back bearings are interchangeable with any standard raised-back bearing, simply by using a flat-bottomed wedge. Bearing dimensions, in each size, are the maximum which can be easily installed in the journal box through the standard lid opening.

Here's a new approach to the problem of journal box stabilization—a low-cost fabricated journal stop with forged steel frames and renewable bronze inserts that hold the journal in the center of the box even under the most severe car impacts. The frames are welded to the inside of the journal box and need never again be removed. Wear occurs only on the brass inserts, which are easily and inexpensively replaced during wheel changes, without any special tools.

The big advantage of the MAGSTOP is low-cost installation that can be accomplished quickly whenever side frames are removed for any reason. The bronze inserts provide ample bearing area and can easily be replaced, if required, without shopping the car.

By limiting journal movement within the box, MAGSTOPS greatly increase bearing life, protect against dust-guard damage, prevent loss and contamination of lubricant. They reduce wheel flange wear, too.

MAGNUS METAL CORPORATION
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DEDICATED TO PROGRESS
RI MEMBER

Hydraulic Drives Have High Capacity

(*Continued from page 22*)

Adhesive weight can be used more efficiently and there is less possibility of wheel slip. This arrangement is used on the Type BB-9400 electric locomotives of the French National Railways (RL&C, May 1960, p 38). The General Motors GA-8 locomotive is an example of a low-horsepower diesel-electric locomotive which utilizes cardan shafts and axle drives to couple two axles with a single motor (RL&C, January 1959, p 18). This is an arrangement typical of that used with hydraulic transmissions.

The cardan shaft, originally developed for highway vehicles, must meet very exacting requirements when used for railway applications. These design problems have been solved. Many high-power, truck-type, diesel-hydraulic locomotives with cardan shaft drives have already been in operation for long periods, proving their dependability.

Voith Transmission

Because a single hydro-dynamic circuit—either a torque converter or a fluid coupling—cannot be effective over the entire speed range of the locomotive, several consecutive circuits must be provided for successively higher speed ranges. Usually, hydraulic circuits for three ranges will be satisfactory to give a high starting tractive effort and a useful maximum speed.

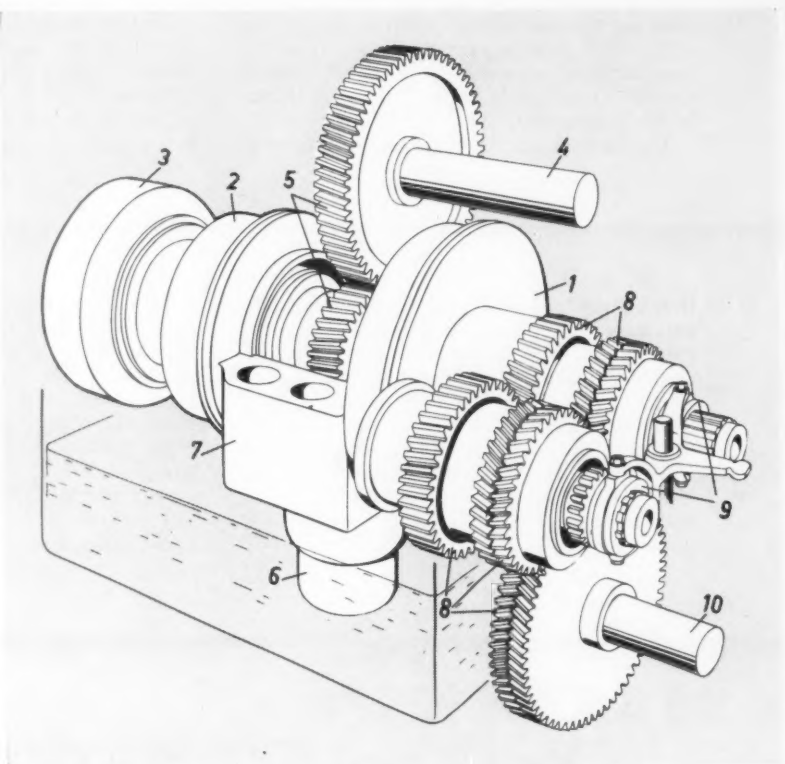
Another way to do this is to use a series of different gear ratios behind a single torque converter. With this arrangement, gears have to be changed while the locomotive is moving. The Voith transmission adjusts for the different speed ranges by filling and emptying the hydraulic circuits of the torque converters and hydraulic couplings. Each such circuit covers a well-defined speed range in which it operates at optimum efficiency.

The pump impellers are keyed on a single primary shaft which is usually driven from the diesel engine through a step-up gear. Step-up gears make possible smaller rotating parts and permit a given transmission to be used with engine of different horsepowers and speeds by changing the step-up gear ratio. Turbine runners of the different hydraulic circuits are connected to the output shaft through gear sets that are permanently in mesh. A small filling pump driven off the primary shaft and a piston-type distributing valve control filling and emptying to engage and disengage the hydraulic circuits of the transmission. trolled by track speed and engine output. During changeover, the filled oil circuit empties while the next is filling, so there is no interruption in tractive effort. There are no wearing parts, with the exception of the gears and bearings.

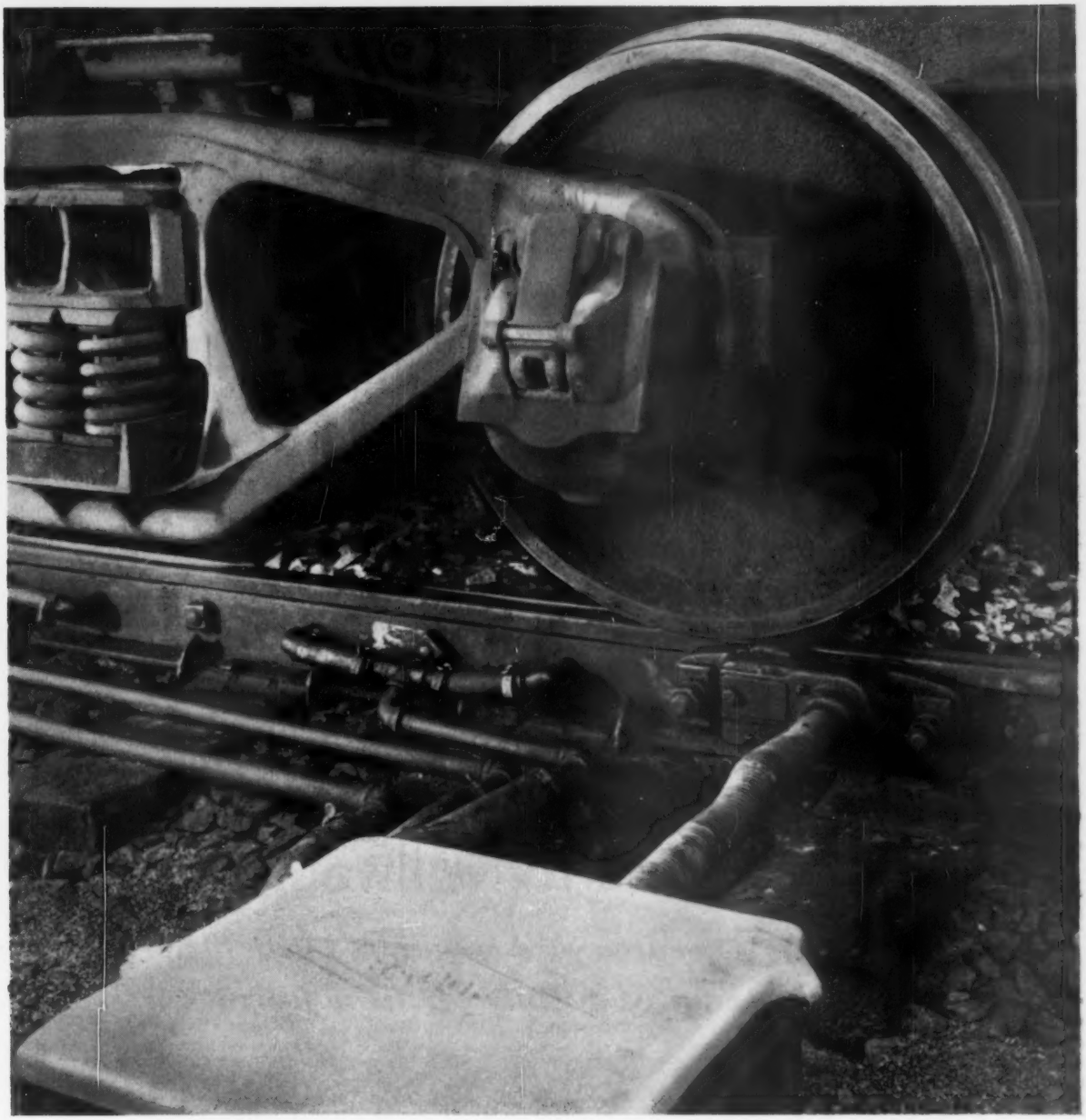
In the conventional Voith turbo transmission, hydraulic circuits are adapted to different speed ranges both by varying the individual turbine designs and by using the same turbines, but varying the gearing between them and the output shaft.

Space restrictions in a high-horsepower locomotive made it desirable to simplify and reduce the size of the high-power Voith transmission. The three hydraulic circuits have been adapted for the three different speed ranges only by varying turbine blading. To obtain the accepted speed-tractive effort curve with such a simplified rotor, it was necessary to develop a starting torque converter with extremely high torque multiplication.

Elimination of step-down gears from this Voith transmission means some improvement in efficiency. Without these gears, the oil sump could be designed solely for filling and emptying requirements of the fluid circuits. are driven through a step-up gear. The primary shaft and pump impellers These transmissions have two torque converters and one hydraulic coupling. Reversing is accomplished by five spur gears and two claw clutches which are operated at standstill. An additional set of gears makes it possible for a locomotive to be operated either in passenger or freight service by establishing two overall speed ranges with optimum tractive effort characteristics in each. These gears, making possible a dual-purpose locomotive, are also operated at standstill. Engine cooling water and transmission oil pass through the heat exchanger on the top of the Voith transmission.



Schematic diagram of the rotor of the Voith transmission, which includes three hydraulic circuits, indicates following parts: (1, 2 and 3) hydraulic circuits; (4) input shaft; (5) step-up gear; (6) filling pump; (7) piston distributing-valve; (8) reversing gear; (9) claw clutches for reversing gear; (10) input shaft.



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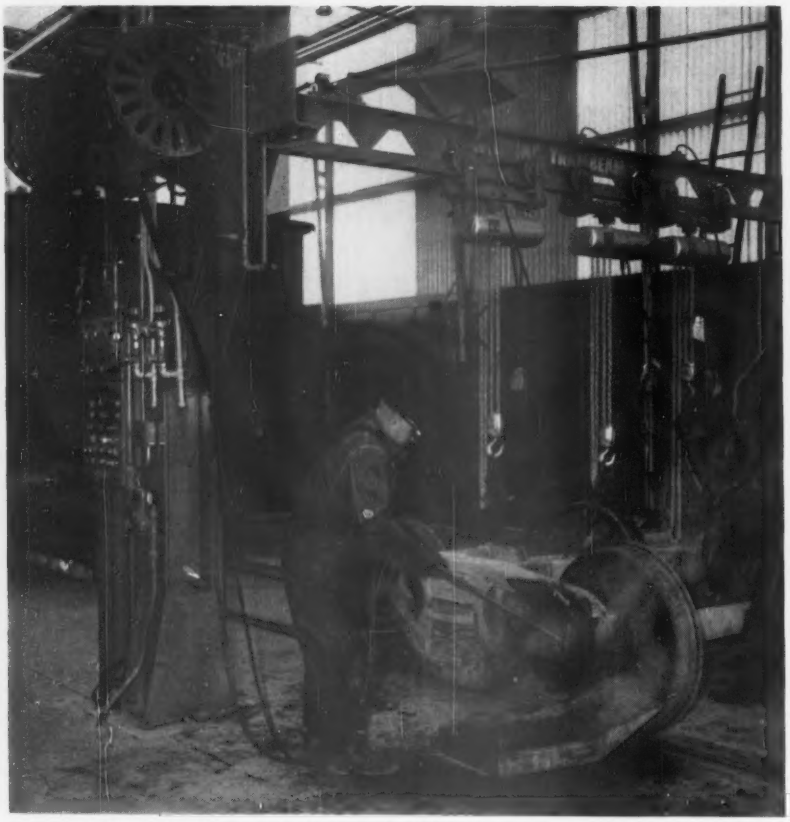


Boxes are blown with mixture of Stanisol and air. When jib crane is across track or jacks are up, cars cannot be moved into working area. Car-moving controls are mounted on crane mast.

'Spot' Car Repairs for Milwaukee

Chicago area yard is equipped with high capacity, mechanized facility for light freight-car repairs

Reduced per diem costs and improved working conditions are two of the benefits resulting from the $1-million investment which the Milwaukee has made in a one-spot car-repair facility at Bensenville, Ill. The road chose its major Chicago area classification yard for this installation—the first one-spot facility it has built.

Production is now averaging 85 light repairs daily with round-the-clock operation. Delays to cars requiring light repair have been greatly reduced, providing better service for shippers. The 120- x 120-ft fabricated shop building houses four service tracks and is immediately south of the hump at the west end of the classification yard. An adjacent stub-end outdoor track serves as a location for handling wheels and for doing heavier repairs which might delay the production-line facilities.

Individual service tracks, designated A, B, C, and D from the north, are each equipped with two Whiting 40-ton, recessed, traversing jacks which can raise a car within 25 sec. Cars are spotted at the jacking locations by spring-operated, air-release retarders. Each track has a pair of Whiting Tram-beam jib cranes for truck repairs. Each crane has a 1-ton electric hoist for lifting bolsters and two ½-ton electric

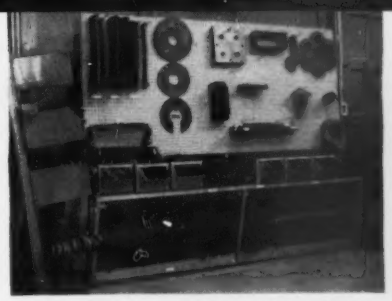
Inbound tracks are equipped with the RMC car puller and counterweight towers. Wheel storage area at far right has capacity for 450 wheel sets. Storage is arranged for crane handling.

hoists for handling side frames. Retractable hose reels mounted on the mast of each jib crane supply car oil, compressed air, cleaning solvent, and oxygen and acetylene. Electric welders, mounted overhead at each track, are also equipped with retractable cable reels.

The building has continuous overhead doors along the north and south walls. Eight natural-gas infra-red heaters are spaced above each track between the jib crane installations to heat the work areas. Clear plastic panels in the roof and side walls give maximum daylight illumination. There are high-intensity, mercury-vapor floodlights for night operation. All piping is color coded: yellow - acetylene; orange - solvent; green - oxygen; black - car oil, and gray - air. Speaker and intercom systems make possible contact with the inbound and outbound leads, the yard master, the heavy repair work area, and the wheel track.

The repair facility operates constantly. Two carmen are assigned to each track on each of the three shifts. Three additional carmen are assigned on each shift—an air-brake man, a write-up man, and a lift-truck operator. Supervision includes day and night general car foremen, and one foreman for each shift. The wrecking crew, consisting of eight carmen supervised by the general car foreman, handles heavy car repairs in addition to cleaning track duties and rerailing of equipment.

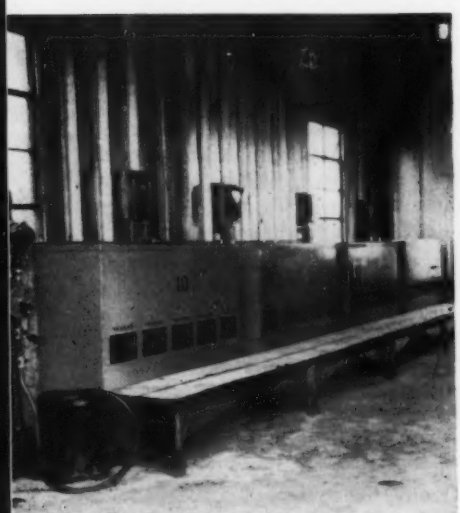
Facilities, in addition to the repair building, include an office, locker room, boiler and compressor room, and stock room. A separate lube pad building is equipped with four vats capable of saturating a total of 800 pads. Oil heated to room temperature is pumped into the soaking vats and is drained after the proper interval, leaving the pads ready for application. Pads removed from cars are shipped to the Milwaukee, Wis., shop for renovation and repair. Tracks in the wheel storage area are laid out on an angle to the service roadway, from which a fork lift can pick up wheels without moving them onto the concrete pavement.



Peg boards make possible a neat arrangement of repair materials and tools in repair area.

Dust-guard dispenser was designed in shop. It is easily reached from all the repair tracks.

Repair parts, materials and tools are stocked conveniently at each of the repair stations.



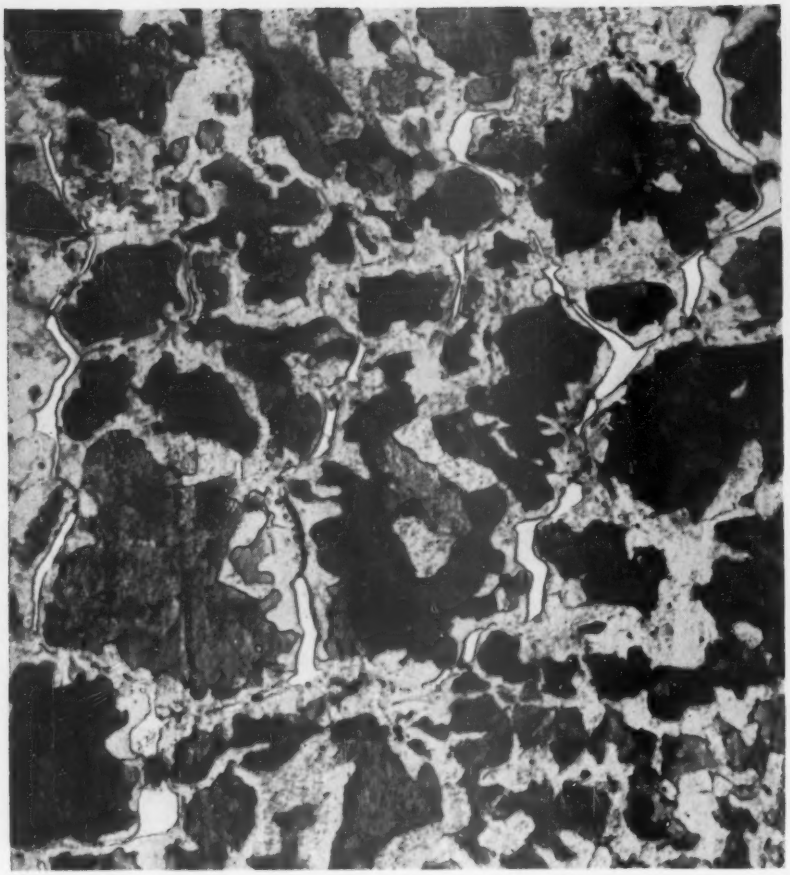
Vats for saturation of lubricator pads are dated to insure proper soaking intervals.

Parts required for regular maintenance are stored and readily accessible along each track. "Lazy Susans" contain nuts, bolts, rivets, welding wire, and similar parts. Gaskets and hand tools are mounted on peg boards. Repair materials, including larger items like side frames, couplers and bolsters which are stored immediately outside, are handled in and out of shop by lift trucks.

Cars are carded for the shop in the receiving yard where both eastbound and westbound cars are inspected on arrival. During humping, shop cars are switched to one track on the south side of the classification yard. Cars requiring normal light repair are moved to an available service track, usually in nine-car cuts. Heavy repair cars are generally moved to the wheel track, although some are repaired on Track A.

The switching locomotive spots the incoming cut of cars on a service track so the coupler of the second car is opposite a "spot" post. From here, the cars are moved by a large between-the-rails "rabbit." The operation, including movement of switches and derails, is controlled from a pushbutton panel at each track inside the building. Lights on the panel indicate locations of cars and pullers. The shift foreman handles locking and unlocking of switches to place cars on inbound service tracks and also operates the large rabbit for the initial pull. Further movement of cars is controlled by carmen.

Cars are generally moved into the shop in pairs. The second car is cut off at the doorway and the first moved to the spot position. In-date air-brake testing is done at the doorway. A compressed-air outlet is located here and there are also two more at each jib crane. Repaired cars are moved outside about three car lengths from the doorway by a small rabbit and then roll down the outbound track by gravity. Each track has a capacity of about 12 cars. The small rabbit returns automatically to the doorway. A spring switch prevents cars from being pushed back into the work areas when the yard locomotive pulls cut from outbound tracks.



Sharply outlined white areas represent copper films in the grain boundaries of an otherwise normal axle steel. Copper has been found to penetrate from the surface during overheating.

Journal burn-off, or hot fracture, indicates a single continuous heating to complete failure.

Cold break journal failure has peripheral zone with thermal checks from earlier overheating.

New York Central Research Shows . . .

Turning Removes Copper Penetration

Any discoloration of car journals because of overheating should be followed by turning to a depth which will remove all traces of copper that penetrates the axle steel from the heated bronze journal bearing. This is the conclusion of the New York Central technical research department in its study of the penetration of bearing metals into journal surfaces and subsequent journal failures.

Metallurgical investigation of hot fractures attributable to penetration of bearing metal into journals at elevated temperatures has shown that these follow a single continuous heating to failure, the so-called "burn-off." Another type of failure, usually referred to as a "cold break," also results from overheating. This fracture exhibits a circumferential zone of irregular detail from which progressive type failure has developed. The circumferential zone fracture evidences growth of thermal checks and intergranular separation resulting from bearing metal penetration during a previous overheating.

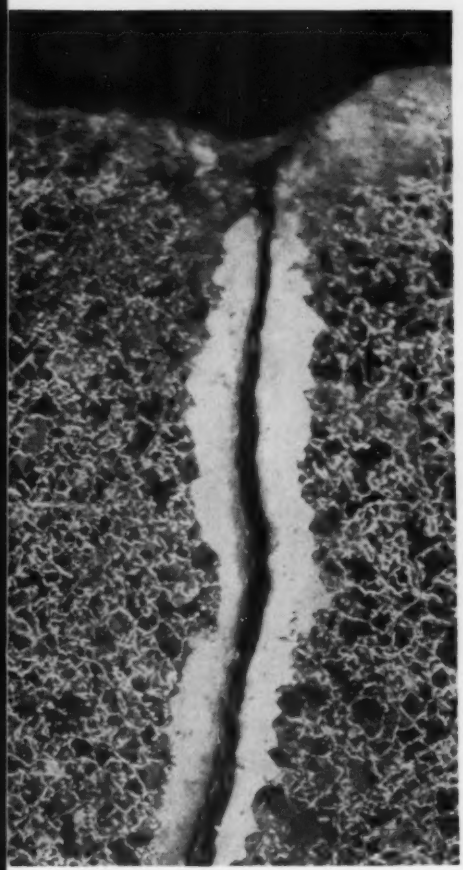
From "A Study of Copper Penetration in Overheated Journals," by T. R. Fredriks, manager —applied research, New York Central.

Copper Predominates

The predominate bearing alloy metal and the one most able to penetrate an overheated steel journal is copper. It was used by the NYC researchers as the element which determined the depth of harmful penetration. "Copper penetration" is the result of conditions that cause copper from bronze-backed journal bearings to be absorbed *intergranularly* by the hot steel journal; it is not the migration of molten bearing metal into thermal checks or cracks in the journal.

To determine the extent to which overheated solid bearing journals are damaged by intergranual penetration of non-ferrous journal-bearing material, the research laboratory selected two "burned-off" journals which had indications of a large amount of intergranular bearing-metal penetration. A transverse slice was taken from each burned-off journal adjacent to the failure. Each slice was cut into eight sections, bordering on the journal periphery. These were then analyzed spectrographically for copper.

Results of spectrographic analysis show that, at depth of 0.040 in. and greater, the amount of copper remains fairly constant and corresponds with axle steel. Additional spectrographic



Bearing metal migration into journal surface crack differs from intergranular penetration.

Microstructures of journal steel show that intergranular penetration is essentially surface phenomena. Micrograph from just below journal surface (left) shows the presence of copper (marked by arrows) in the ferrite regions. Micrograph of section 0.0625 in. below journal surface (right) shows no evidence of copper penetration.

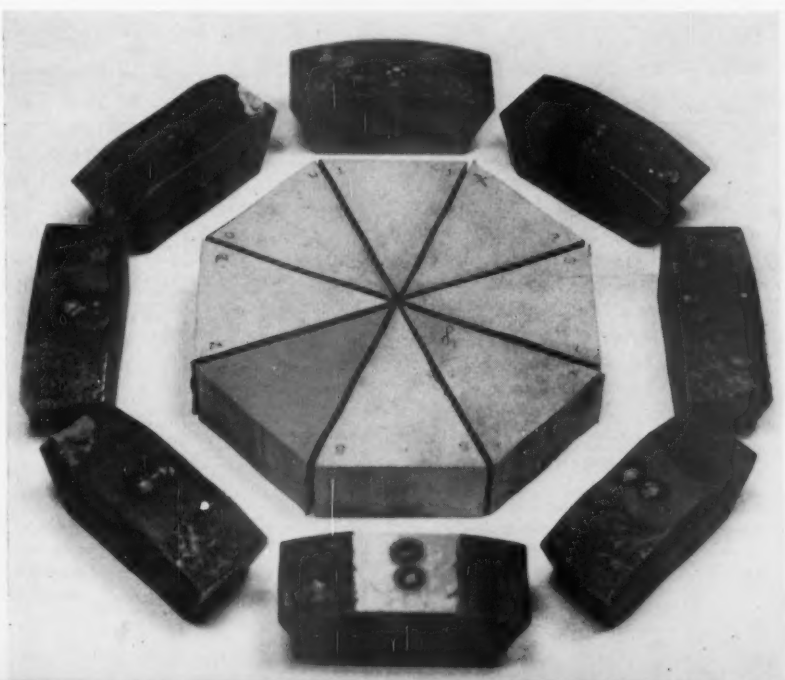
analyses of both journals 1 in. below the journal surface yielded results comparable to the values obtained at the depth of 0.040 in. in the periphial sampling. These low percentages (0.04 and 0.075%) of copper apparently represent residual quantities.

Metallographic study disclosed that copper is not present as a grain boundary phase at depths greater than 0.040 in. Slightly below the journal surface copper films are in the ferrite regions. Normal microstructure of pearlite and ferrite with no copper in the grain boundaries were at a 0.0625 in. depth below the journal surface. It was concluded that injurious penetration of copper or other non-ferrous metals into the steel did not go deeper than 0.040 in. even under the most severe heating conditions.

It should be possible to avoid "cold break" fractures resulting from journals having low fatigue life caused by non-ferrous metal intergranular penetration and also to conserve journal material and prevent the scrapping of axles that can be restored to serviceable condition.

Turning Recommended

It is the recommendation of the NYC technical research department that any journal discolored from overheating, regardless of the severity, should have at least 0.0625 in. removed from the surface (0.125 in. on the diameter) at the smallest diameter. If the journal is cut, grooved, or gouged, the .0625 in. should be measured from the point at which this damage is "cleaned up." After the journal has been turned, it should be thoroughly examined for cracks by wet Magnaflux or Magnaglo and visually for any indication of migration of bearing material into thermal checks or cracks that may have resulted from overheating. If, in the judgment of the wheel shop foreman, inspector, or machine operator, the journal will not finish within the shop condemning limits, it should be scrapped before machining.



Slice of axle, used to determine depth of copper penetration, was sectioned and each succeeding sample was machined to 0.010 in. greater depth for analysis.

Remote control equipment has been applied to 150-hp switcher which is presently undergoing tests at the General Electric locomotive plant.

Radio-Controlled GE Locomotive

Remote control of an industrial switcher has been possible with development of special transmitter.

By N. N. Turner

The first remotely operated, radio-controlled General Electric locomotive, which was exhibited last fall for the American Short Line Railroad Association, has been designed to fill a growing demand for a locomotive which can be controlled by an operator situated at a distance from the locomotive. Control of its functions is maintained by radio communication between a portable transmitter carried by the operator and a receiver mounted on the locomotive with a maximum range of approximately one-quarter mile (RL&C, Nov. 1960, p. 21).

Remote locomotive control may be desirable in hazardous locations, or where improved visibility from a remote position may lessen the chance of personnel injury or equipment damage. Improved visibility may make possible more efficient performance, for instance, in loading hopper cars if the operator can observe the loading and move the locomotives as needed. Remote operation also increases the operator's versatility by allowing him to perform other duties.

Radio control equipment consists of three principal groups: a portable transmitter, a receiver, and the associated control equipment on the locomotive. The present transmitter, 3½ in. by 10½ in. by 12 in. and weighing 15 lb, is to be replaced by a compact model of only half the size and weight. On the transmitter top are the control switches and "deadman" safety switch. The transmitter is completely watertight. The rechargeable battery pack in the transmitter is designed to oper-

Mr. Turner is in Locomotive and Car Equipment Department of General Electric at Erie, Pa.

ate the equipment over a normal working day and can be recharged overnight. Stationary transmitters are also available.

In operation, the transmitter emits a continuous carrier which keeps a "fail-safe" pilot relay in the receiver in the closed position, forestalling emergency power and brake conditions. On the transmitter control functions are initiated with momentary-contact, on-off switches. The transmitter also has a power on-off switch and a "power-on" indicating light. The deadman switch, which removes the carrier in case of operator failure or other emergency, is a hand-operated unit which must be held depressed by the operator at all times when he is controlling the locomotive. The receiver, adequately shock mounted on the locomotive, converts the signals from the transmitter into appropriate locomotive control functions. Like the transmitter, the receiver enclosure is completely watertight. Power for operation of the receiver is obtained from an auxiliary power supply driven by the diesel engine.

Receiver output operates six pilot relays, two in combination for each of the ten controlled functions plus one for the "fail-safe" feature. Each relay has contacts capable of interrupting an inductive load of 2 amp at 37½ volts d-c. The five control relay contacts are normally open, closing only as selected by the remote transmitter. The relay for "fail-safe" feature is open when de-energized and closes when the equipment is in normal operation.

The operator's panel and controls on this locomotive appear much the same as those found on an ordinary manually controlled locomotive, with the exception of two switches on the gage panel labeled *Manual-Remote* and *Radio Power*. Transition from manual to radio remote control is simple.

The locomotive is first started in the normal manner. After air pressure is pumped up and the engine warmed up, the operator places the *Radio Power* switch in the *On* position. He then moves the throttle handle to *Idle*, places the reversing switch in neutral, and the brake valve in the *Release* position. Finally, he moves the *Manual-Remote* switch to the *Remote* position, causing an immediate brake application, which continues until the operator takes control at the remote station.

Safety control on the locomotive consists of interlocking which prevents application of power to traction motors, applies brakes, and holds the engine at idle speed. It will be operated by release of the deadman switch, by malfunction of the radio equipment, or when receiver moves out of range of the transmitted signals. None of the other functions on the radio transmitter can be operated until this safety control has been put in the operating position. When the operator at the remote station presses his deadman safety switch, the safety control on the locomotive releases the brakes and places the locomotive in readiness for remote control operation.

Control of the locomotive brakes by the remote operator is accomplished through use of a single-pole, double-throw, momentary-contact control switch on the transmitter. Moving the switch in one direction causes a brake application; movement in the opposite direction releases the brakes. When this momentary switch is moved in the brake application direction, a magnet valve on the locomotive allows air to feed to the brake cylinders until this switch is released. When the switch is released, brakes lap and hold the pressure in the cylinders at the time of release. This pressure is maintained until the brakes are released through movement of the switch on the transmitter to the brake release position, or until the brake pressure has bled off through normal leakage. Operation of the brake-release switch will cause air to be exhausted from the brake cylinders until the switch is released, or until the air is completely exhausted. An emergency brake-magnet valve, used in conjunction with the safety control, is arranged so that it will override the brake-release magnet valve to allow instant application of the brakes and

Portable transmitter has series of toggle switches on top for control of locomotive functions and has deadman safety switch on extension cord which must be held by operator.

Receiving equipment is mounted in cabinet on locomotive running board ahead of cab. Antenna is mounted atop hood. Unit has indicating lights to guide the operator.

prevent air being bled off by the brake-release magnet valve.

Direction of locomotive motion is selected by operation of the *Reverse-Forward* switch. Like the brake-control switch, this is also a single-pole, double-throw, momentarily-operated switch with a center *Off* position. Operation of this switch causes air to be fed through a magnet valve to move the electro-pneumatic reverser and set up circuits which give the direction of motion desired. Proper interlocking of control circuits prevents operation of this reversing switch either in manual or remote operation when the throttle is at any position other than idle.

The diesel engine throttle control on the locomotive is of the air-operated type. It consists of a master air piston mechanically connected to the manually operated hand throttle in the locomotive. This master piston controls a slave piston mounted on the engine and connected to the engine fuel control. Any change in position of the piston on the master air cylinder causes a change in position on the slave cylinder and a corresponding change in engine speed. In remote operation, the slave piston on the throttle is actuated by either one of two solenoid valves, one of which admits air to this slave piston, while the other exhausts air from the piston. These are controlled, respectively, by the *Throttle On* and *Throttle Off* switches on the transmitter. Selection of engine speed is available over the complete range from idle to full speed. Application and release of the *Throttle On* switch on the transmitter will cause the engine to hold the speed at the time of release until the *Throttle On* or *Throttle Off* control on the transmitter is again actuated. This throttle control is interlocked so that operation of brakes will return the throttle to the idle position.

For each of these locomotive functions—brakes, forward-reverse selection and throttle operation—there are indicating lights provided on the exterior of the locomotive. These show the operator whether or not his brakes are applied, whether his throttle is at idle, and in which direction the locomotive is set up to operate.

In addition to these basic functions, the radio equipment can also remotely control other functions on the locomotive, such as bell ringing, whistle, sanding, uncoupling, and car dumping. The radio control equipment conforms to existing federal requirements governing the operation and construction of such apparatus. It is capable of performing ten independent functions, none of which is transmitted simultaneously. Provision is made for future installation of additional functions.

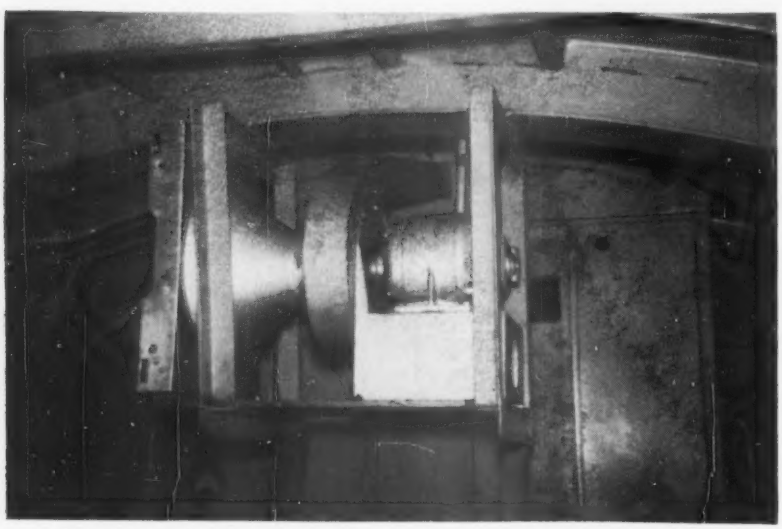
The pilot locomotive is presently in service at the General Electric plant in Erie, Pa., where it is undergoing evaluation in industrial switching

Pressurizing Pays Off for B&O

Electrical controls, the nerve system of the diesel-electric locomotive, must be kept clean and in good working order to prevent road failures. Dust, lint, and oil vapor from the engineroom which can accumulate on contactor and interlock surfaces in control cabinets may cause burned spots, making controls inoperative.

Service tests made by the Baltimore & Ohio indicate that the pressurizing of the control cabinets excludes contaminated engineroom air from these cabinets, keeps cabinets and controls clean, saves on maintenance, and helps to reduce road failures.

Using the EJB pressurizing assembly kit made by the E. J. Boyle Co., the B&O has now made several installations which deliver clean air under pressure to the tops of the control cabinets. To date, the EJB kits have been applied to nine locomotives—three Alco road freight units and six GM road freight units. First B&O installation was made 34 months ago.



Pressurizing kit has been applied without complication on Alco and EMD road diesels.

There have been no special application problems; one of the kits can be installed on a road freight unit in about 4 hr.

Air pressure developed within the cabinet depends on its size, but the normal range would be 1 to 8 oz above atmospheric pressure. Tests indicate that pressurizing will materially increase the maintenance intervals at which the cabinets and controls require cleaning and at which the controls require adjustment.

Inspection of controls in one cabinet which has been protected by an EJB kit for two years showed the controls to be in very good condition. Indications were that it would be possible to continue to operate this unit for an even longer period with nothing but normal inspection.

The B&O estimates that savings made by extension of maintenance periods and by elimination of road failures will amortize the investment in this kit and its installation costs in approximately one year.

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Doc Discusses Low-Throttle Diesel Operation

By Gordon Taylor

Engineman Tom Hacker was disturbed when he saw the string of cars added to his train at River Junction. He already had a long train. With these extra cars, he knew he was faced with a "drag" pull on some of the grades ahead. He told this to the conductor while the River Junction switcher was adding the cars.

"So what?" the conductor responded. "Just take it slower and you won't hurt your precious diesel."

"That's what you think," retorted Hacker. "Slow movement with a very heavy train registers more amperes on that load meter, and those amperes are responsible for most of the heat in the motor. When we get home, I will ask Doc Watts at the Diesel House about this."

When Hacker saw Watts, he said, "I wish you'd set me straight on something. How long will it take to do damage to a traction motor drawing 500 amp with throttle open to Run 2?"

"That's some question," said Doc, "one that even the builder would have trouble answering. I'll say that you are correct in being concerned about slow speed operation with heavy currents, so let's go over this if you have time."

"Go ahead," said Hacker. "This is important to me."

"It's like this," Doc went on, "heating effect in an electric motor is proportional to the number of amperes squared, times the ohms of resistance in the windings. In other words, amperes times amperes times ohms. In a formula it is shown as I^2R. Because resistance in such a circuit is of very low value, the currents, or amperes, flowing largely determine the heating effect. The length of time that the motor is subjected to heavy currents is also important. Periods of light load, or drifting, between intervals when heavy currents are used do give the motors opportunities to get rid of some of their accumulated heat. It is important for the traction-motor-blower fans to operate at higher speeds to cool the motors.

Resistance Calculation

"Now, let's go back to the formula I^2R to figure the watts that heat the motor. When we multiply amperes by amperes, it means something you might not think of at first. It means that the heating effect varies as the square of the current, or put another way, if we were to double the amount of current in the motor, we would have four times the heating effect. If we were to triple the amount of current in the motor, the heating effect would be three times three, or nine times the original heating effect. You can see the importance of holding amperes within a reasonable limit.

"Watts which move the train are expressed as watts equal volts times amperes, or E times I. You can see that when power watts are made up largely of voltage that the heating effect of amperes is minor. In other words, it is better to operate at higher voltage and thereby develop the necessary power with lower current values.

"From this we learn that amperes are needed for tractive effort to start heavy trains and that volts are needed to step up train speed, with use of fewer amperes. Is this clear?" asked Doc.

"Yes, I can understand most of it," replied Hacker, "but now tell me why amperes drop as train speed increases."

"Good question," said Doc. "There are two things limiting the flow of current in a motor. They are the resistance (in ohms) of the wire in the windings to the flow of current and, second but of most importance, the counter electro-motive force, or counter voltage generated in the motor winding. This counter voltage opposes the voltage that is fed from the generator to the motor and effectively reduces the amount of amperes that the motor will accept from the generator."

At this point, Hacker said, "Doc, can you make this counter voltage idea a bit plainer; I am not familiar with it."

"You can run up against a similar situation," said Doc, "every time you start your car. When you crank the engine, it draws a heavy current from the battery. With the engine running, the generator starts charging the battery at a heavy rate. It can do this because the battery voltage is too low to effectively oppose the generator voltage. The battery accepts the heavy amperes for a little while, during which

This series of articles is based on actual experiences of men who operate and maintain diesel-electric locomotives.

the battery charge is restored to the point where its own voltage more nearly equals that of the generator. The counter voltage from the battery reduces the current from the generator and the charging continues at a reduced rate. That is another example of counter voltage at work.

"Now we'll return to counter voltage generated in traction motors. The motor armature revolving in a magnetic field sets up the counter voltage. As the armature starts to turn in its own magnetic field, it begins to function as a generator as well as a motor and generates a voltage that is opposed to the voltage of the main generator. This is called counter voltage. The amount of counter voltage depends on the motor armature speed and field strength. At low speed, the armature generates low counter voltage and accepts higher amperes from the generator. At higher speed, the motor generates higher counter voltage, which means it is more effective in reducing the amperes supplied by the generator. Remember, volts represent the pressure that causes amperes to flow.

Counter Voltage

"It is a good thing that electric motors produce counter voltage. Things would be in a mess without it. The electrical resistance of the motor windings is so low that, without counter voltage, it would be like connecting the generator to a short circuit. The resistance value, alone, of the motor circuit simply could not limit the armature current to a safe value.

"Now," said Doc, "we will return to your original question. How long can you safely operate diesel traction motors drawing 500 amp when the engine throttle is in the Run 2 position? That question has come up before, and we have never had a firm ruling on it, even from the builder's representative. I have made some estimates of my own which may help you. These are based on certain values that the builder has approved.

"Consider some older model units, such as Model F-7 wired for dynamic braking. When dynamic braking was used, the throttle was placed in 'Idle' position, and the transition lever was in 'off' position. Any other position would defeat the purpose of the brake, even if it were possible. During dynamic braking, the throttle was left in 'Idle' position and the engineman regulated the amount of braking effort by moving the handle of the transition lever. The load meter had a red triangle on the indicating scale at the 600-amp mark. A brake warning-light would light up to indicate that the traction motors were generating the maximum amount of braking current allowed. This 600-amp limit was set for the protection of traction motors and the brake-resistor grids.

"Now we have established the fact that the builder approved the operation of traction motors with the armatures producing 600 amp when the engine throttle was in 'Idling' position; that is, the engine, generator and alternator were all operating at 275 rpm, which means the traction-motor blower fans were operating in their lower speed range.

"To answer the original question, we now compare the heating effect of 500 amp passing through the traction motor when pulling as compared with the heating effect of 600 amp passing through the armature of a traction motor in dynamic braking service. When operating with the throttle placed in No. 2 position, the engine would be running at 350 rpm. This would cause traction-motor blowers to operate at slightly higher speed than would be the case with unit in 'braking service' with engine speed of 275 rpm.

"With these facts in mind, it is my opinion it would be as safe to operate at 500 amp when pulling as to operate at 600 amp in dynamic braking service. Where slow orders require reduced speed operation in throttle 2 or 3, I think 500 amp may be considered safe. As a general rule, it is better to operate at speeds that reduce ampere load, if operating rules permit the higher speed.

Short-Time Ratings

"EMD Operating Manual 2310 for F-7 units suggests operation using short-time rating be in Throttle 5 or higher. This will provide adequate air from the traction-motor blowers to provide proper ventilation and cooling of motors. It also means that locomotive speed will be higher on the grade and that the *time* in overload will be held to a minimum. Of course, in starting or accelerating a train, the amperage will be high in the low throttle positions, but, if the locomotive is not completely overloaded, the amperage will reduce as the speed picks up and the load meter will soon show a safe value.

"When locomotives are to be operated at slow speed and high tractive effort, as in a hump yard, special hump controls are used. Hump control is a method of control of generator excitation in which the throttle is advanced adequately and excitation is controlled to give proper hump speeds."

Doc then said to Hacker, "I would like to tell you about a case that happened several years ago when we first got diesels. A small 44-ton unit was involved. It was operated by an engineman who was not much concerned and took no trouble to learn. A long drag of freight cars had to be moved to a train yard about four miles away. When the locomotive turned in at the end of its shift, it was really hot; the generators and motors were like stoves. The engineman said, 'I don't understand it. I knew the load was heavy, but we did not stall; we kept moving at about 2 mph. I did not think the unit would be working too hard at such slow speed.' He simply did not understand that it takes higher speed than 2 mph to generate the counter voltage that holds the ampere load to a safe value. The 2-mph speed imposed by heavy drag just invited in more amperes than the motors could safely handle. The result, some badly overheated motors and generators that required expensive repairs.

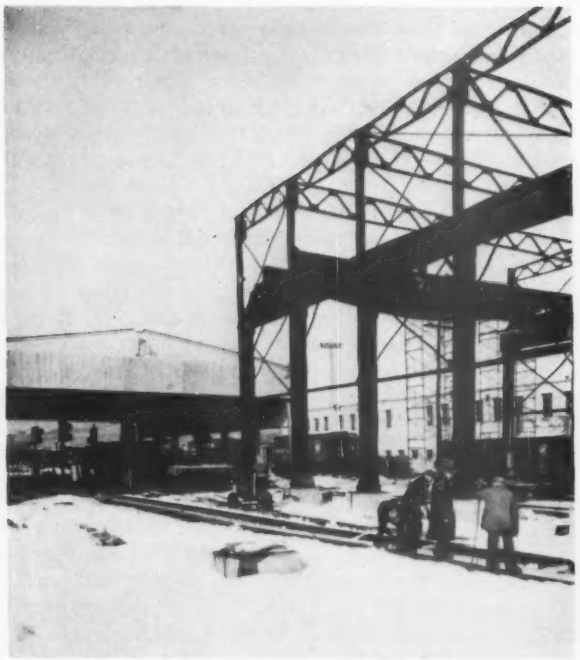
"In recent years, the builders have done much to improve the ability of traction motors to handle heavy loads. This has been accomplished by the use of new insulating materials and methods of application to improve motor ventilation. The improvement has been so great that the load meters on later model units do not have a red zone on the load meter scale. This red zone was used on the load meters of early model units to warn that the ampere loads indicated in that zone could be used for limited periods only.

"I believe," continued Doc, "That this wraps up this matter. If you have other questions that I can help you with, please call on me. It is refreshing to find someone who wants to learn more about his job. Today, I have learned just how to classify you."

"What do you mean by that?" said Hacker.

"Well," said Doc, "in my book there are just two kinds of people in the world—some folks live and learn; others just live. You belong to the first group."

Pennsy 'Spot' Repairs

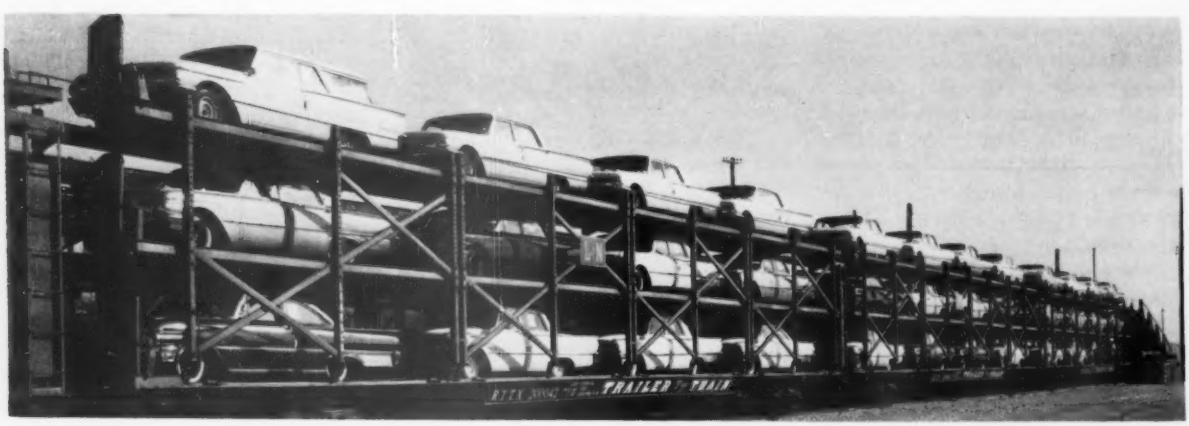


"Largest" classification yard—Pennsy's Conway Yard near Pittsburgh, Pa.—is currently being equipped with a $1-million facility to make light car repairs. Interesting feature will be 40-ton overhead crane with push-button controls (right) which is being installed to adjust and transfer loads. Repair shelter is 70 x 120 ft and is equipped with radiant heated working platforms, high intensity illumination, and efficient tools. It has two through tracks, one of which will be equipped with mechanical car puller, or rabbit. Cars on the other track will be moved by a Trackmobile. The new shop is adjacent to, and will handle cars from, the eastbound receiving and classification yards. It complements a smaller shop which went into operation last year in the westbound yard. During 1960 a total of 1,692,036 cars moved through the eastbound and westbound yards. Of these, 31,000 required repair work at Conway shop.

D&H Materials Handling

Two Austin Western Model 110 hydraulic cranes put into service by the Mechanical Department of the Delaware & Hudson have been found to give great flexibility in the materials handling operations at D&H car maintenance facilities. They have been found equally useful for indoor and outdoor handling jobs. Telescoping boom and hydraulic controls make it possible for the crane to pick up and deposit loads in box cars without difficulty. Among the requirements for cranes as listed by the D&H were: 1) Operator has to see load at all times; 2) boom and swing have to be power actuated; 3) controls have to be compact and easily managed, and 4) boom has to be extended and shortened hydraulically for easy operation and to save time. Full use of hydraulics provides smoothness of operation; permits inching of loads to precise position without jarring or slipping, and gives operator constant and positive control.

TTX Tri-Levels Undergo Impact Tests



Lo-Dek flat cars equipped with Dana Corp. Tri-Level auto racks underwent tests at the Pullman-Standard Research and Development Center in Hammond, Ind. Resilient racks, fabricated in 20-ft sections, are mounted on the 85-ft TTX cars which were also fitted with P-S 10- and 20-in cushion underframes to test their comparative performance at impact speeds up to 10 mph.

Report

(*Continued from page 5*)

been lowered to the thermostat setting. Cooling fans are then stopped by the thermostat, and the motor-operated dampers in front of the cooling fans automatically close, preventing air flow through the bunkers resulting from natural convection. As lading air temperature rises to the thermostat setting, controls open the dampers and restart cooling fans.

The thermostat control range is from 30 to 70 deg F, with control settings in 5-deg increments. A "Heater Service" switch reverses the action of the cooling fans which stop when the temperature rises to the desired point.

With the constantly operating fans and with thermostats for controlled temperature, PFE says many commodities can be loaded higher in the car with adequate air circulation and refrigeration. Tests run over the past year and a half are said to have been very successful. It is felt that the Ice Tempco cars "will be so helpful in the interim period when mechanical refrigeration cars are not yet available in sufficient quantities," a representative of one growers group commented recently.

Consideration is being given to equipping still another 500 cars with the Ice-Tempco system. All would be completed and in service by August of this year.

Improved Release Test Now Alternate Standard

An improvement to the Standard Passenger Car Single Car testing device to detect with greater certainty causes for failure and help eliminate potential causes of stuck brakes is noted by the AAR Mechanical Division.

The addition of a Flowrator By-Pass cock to the present device and changing to a special rotary valve provides a more restrictive release test. The Flowrator By-Pass cock is that presently used with the Freight Car Single Car testing device except that the lower ball stop has been changed to include a No. 66 drill orifice. All future ½-in. diaphragm cocks manufactured with integral Flowrator assemblies will have a large "P" cast on the body and a downstream connection for the brake pipe gage tube. Assemblies with the symbol "P" may be used with either passenger or freight car devices. Those without will be used only on the freight car device.

New Single Car Testing devices may be purchased complete with this feature, or the required parts may be obtained in kit form for application to existing devices.

No Change in Passenger Car Axles

Center diameter of the 6½ by 12 in. passenger car axle, dimension "k" on AAR Manual page D-3, will not be changed, the Mechanical Division advises. Any such change would affect Spicer drive attachments which are fixed to the axle in this area.

Manual page D-3 was inadvertently included in the recommendation of the Committee on Axles for increases in diameters of the centers of larger axles, which was approved by Letter Ballot. The increase from 6⅞ in. to 7⅜ in. applies only to the standard and alternate standard 6½ by 12 in. freight car axles and will be effective on March 1. The change resulted from studies of numerous axles which failed under cars in ore service.

Elber Retires

C. C. Elber has retired as secretary, Electrical Section, Engineering and Mechanical Divisions. Functions of the section have been absorbed by the two divisions (RL&C, Dec. 1960, p 5).

L&N To Spend $36 Million For Equipment in 1961

The Louisville & Nashville will spend about $36 million for equipment in 1961. In addition to the 900 70-ton hopper cars and 900 70-ton gondolas ordered from Pullman-Standard, as reported in the December issue, 1,000 cars will be rebuilt at Louisville shops, and orders for additional new cars are anticipated.

No new orders for equipment have been reported since the closing of the January issue. However, the Bangor & Aroostook has acquired 200 40½-ft box cars from U. S. Railway Equipment Co. The cars will be upgraded to Class A for use in paper traffic.

The Erie-Lackawanna will repair 725 box cars at Meadville, Pa., at a cost of $1,600,000. The program calls for replacement of roofs and inner linings, and repairs to underframes where needed. The cars will be painted in gray and maroon.

The 36 lightweight subway cars ordered by the Toronto Transit Commission from Montreal Locomotive Works, as reported in the January issue, will cost $3,968,264. The 74-ft cars, reportedly the first to be built in Canada, will be constructed principally of aluminum. Delivery is scheduled for late 1962.

Personal Mention

Akron, Canton & Youngstown.—*Akron, Ohio:* F. M. MANSON appointed superintendent car department and assistant superintendent.

Atlantic Coast Line.—*Florence, S. C.:* C. E. HARPER, JR., appointed master mechanic. *Savannah, Ga.:* D. E. MULLIS appointed general foreman. *Rocky Mount, N. C.:* F. A. GRAY appointed master mechanic. *Ocala, Fla.:* G. C. HARRIS appointed road foreman of engines.

Canadian National.—*Montreal:* L. S. MCGREGOR, general superintendent of motive power and car equipment, Central Region, at Toronto, appointed chief of motive power and car equipment, succeeding ERIC WYNNE, recently named vice-president of newly created Great Lakes Region.

Mr. McGregor became an office boy in

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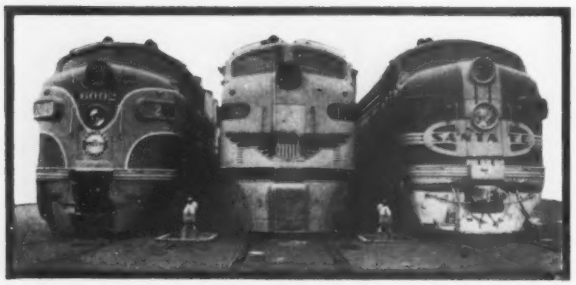

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MICHIGAN CITY, INDIANA

L. S. McGregor

the motive-power department of the CNR in 1926. He attended McGill University, graduating with a mechanical engineering degree in 1936, while completing his apprenticeship in CNR shops during summer months. Subsequently he was assistant foreman, inspector, assistant engineer in Montreal, superintendent of motive power and car equipment, Northern Ontario district, and general superintendent of motive power and car equipment for the Central Region.

Chicago & North Western.—*Chicago:* W. J. WEATHERALL appointed general superintendent—car department.

Erie-Lackawanna. Mechanical department officers of merged roads—*Cleveland:* C. K. JAMES, superintendent motive power; W. G. CARLSON, assistant superintendent motive power; K. H. CARPENTER, superintendent car department; L. E. SCHUETTE, assistant superintendent, car department staff; D. H. DECKER, assistant superintendent, car department, Eastern District; E. D. HALL, mechanical engineer, and G. E. MCKINNEY, chief electrical engineer. *Meadville, Pa.:* A. HUGHES, assistant superintendent, car department, Western district.

Fort Dodge, Des Moines & Southern.—*Boone, Iowa:* DAHRL WRIGHT appointed master mechanic, succeeding J. E. PURDIE, acting master mechanic, retired.

Louisville & Nashville.—*Louisville, Ky.:* C. N. WIGGINS appointed assistant general manager. C. A. LOVE appointed chief mechanical officer, succeeding Mr. Wiggins. J. R. DOUGLASS appointed assistant chief mechanical officer, succeeding Mr. Love.

New York Central.—*New York:* R. L. MARTIN and L. W. BRENNAN appointed general supervisors locomotive maintenance.

St. Louis-San Francisco—*Springfield, Mo.:* L. I. BUFFINGTON appointed assistant to chief mechanical officer.

Soo Line. (Mechanical Department personnel of newly merged Minneapolis, St. Paul & Sault Ste. Marie and Duluth, South Shore & Atlantic.)—*North Fond du Lac, Wis.:* EDWARD W. BEYER named shop manager. *Minneapolis* (formerly with MStP&SSM): EUGENE R. HENKEL, superintendent motive power, now manager, Shoreham shops. HERBERT H. LINK, master mechanic, named chief diesel supervisor, Shoreham. ROY D. JOHNSON, supervisor standards and methods, named diesel supervisor, lines west of Minneapolis. FRANCIS A. WEISS, superintendent locomotive shops, now assistant manager, Shoreham shops. *Stevens Point, Wis.:* JOHN BENZ, mechanical supervisor, named diesel supervisor, lines east of Minneapolis.

Southern. — *Jacksonville, Fla.:* JAMES R. JULIAN appointed general foreman. Formerly general foreman at Alexandria, Va. *Charleston, S. C.:* CLAUDE M. MONTGOMERY appointed road foreman of engines.

Supply Trade Notes

SUPERION CAR DOOR COMPANY.—Chicago sales office moved from 332 South Michigan ave., to general offices at 1928 W. 46th st., Chicago 9.

■

UNITED SPECIALTIES INC.—*H. Y. Martindill* appointed general manager. *Incorporated Sales Industries*—J. A. Rupiper, K. K. Palmer, and G. R. Childress—Houston, Tex., named exclusive manufacturers representative, northeast Texas and western Louisiana.

CAR FOREMAN required for well established Car Shop in Chicago area. Excellent opportunity for right man. Furnish full record of experience with application. All applications held confidential. Box 10, RAILWAY LOCOMOTIVES & CARS, 30 Church St., New York 7, N. Y.

■

ARCAIR CO.—*Donald E. Shryock* appointed field representative in midwest.

■

AIR-MAZE DIV., ROCKWELL-STANDARD.—Air-Maze Corp. now operating as Air-Maze Div. of Rockwell-Standard.

■

RAILWAY SERVICE & SUPPLY CORP.—National sales offices established in Railway Exchange Building, 80 E. Jackson Blvd., Chicago. *F. B. Harrison, Jr.*, vice-president, directs sales operation. Mr. Harrison also heads Harrison Railroad Supply Co. *Thomas W. Timmis*, assistant vice-president, continues to represent corporation in midwest.

■

AIR REDUCTION SALES CO., A DIVISION OF AIR REDUCTION CO.—*L. W. Kunkler* appointed district manager at 1276 Military Road, Buffalo, N. Y., succeeding *R. H. Merriman*, now district manager at Allegheny and 17th st., Philadelphia, Pa.

■

CHICAGO MALLEABLE CASTINGS CO.—*Frank K. Veasman* appointed manager, and *Thomas J. Kemble*, assistant manager, railroad division.

■

NATIONAL MALLEABLE & STEEL CASTINGS CO.—*Howard W. Brandt* appointed vice-president and group executive.

■

MAGOR CAR CORP.—Sales and executive offices moved from 50 Church st., New York, to 660 Van Houten ave., Clifton, N. J.

■

GENERAL ELECTRIC CO.—*Oscar L. Dunn*, general manager, Motor and Generator Div., Erie, Pa., elected a vice-president of G. E. *Gail B. Hamilton, Jr.*, appointed manager of a new Process Automation Sales operation at GE's Industry Control Department, Salem, Va. Department established to examine and develop control equipment specially designed for integration into automated process control systems.

■

CHICAGO RAILWAY EQUIPMENT CO.—*David W. Wallace* elected president, and *Donald E. Barton*, vice-president —

Railroad Equipment Division. Chicago sales office moved from 332 South Michigan ave., to general offices at 1928 W. 46th St., Chicago 9.

■

C & D BATTERIES, DIV. ELECTRIC AUTO-LITE CO.— *Eugene F. Leherissey*, 631 Ravine ave., Lake Bluff, Ill., now handling C & D railway sales in Chicago area.

■

FAIRBANKS, MORSE & CO. — *Thomas G. Lanphier, Jr.*, elected president. Mr. Lanphier also vice-president-planning, Fairbanks Whitney Corp.

■

ELECTRIC STORAGE BATTERY CO.— Exide Industrial Marketing Div., a sales and service organization, created to serve Exide Industrial and new Nickel-Alkaline divisions. *C. J. Moore*, Exide's vice-president—marketing, heads new division.

■

MAGNAFLUX CORP. — Magnaflux has acquired the *Metal Control Laboratories*, Los Angeles, Calif., which will be operated as a part of the Materials Testing Laboratories Division of Magnaflux.

■

NALCO CHEMICAL CO. — *David M. Jacks* and *Thomas G. Cocks* named vice-presidents.

■

EX-CELL-O CORP.—*Ford Supply Co.*— Frank Ford, Nick Swords, and Bert Hayes —appointed sales representatives for Ex-Cell-O railroads products in the southeast. Headquarters, Atlanta, Ga.

Helps from Manufacturers

RR CLEANER. Service Bulletin No. 17B describes Oakite RR cleaner, an alkaline detergent designed to remove burned-on oil, heavy grease, and dirt from railroad equipment. Used also in cleaning tank or in steam-cleaning operations. (Write: *Oakite Products, Inc.*, Dept. RLC, 119 Rector st., New York 6.)

LUBRICANT. 4-page folder describes and lists uses of CMD extreme pressure anti-scoring oil and grease. (Write: *Chicago Manufacturing & Distributing Co.*, Dept. RLC, 1928 West 46th st., Chicago 9.)

ELECTRICAL PRODUCTS. 4-page bulletin B81 electrical connectors, receptacles, switches, and lighting products includes specifications and suggested applications for standard and custom-built electrical connections, also general descriptions of lighting products. (Write: *Joy Manufacturing Co., Electrical Products Div.*, Dept. RLC, 1201 Macklind ave., St. Louis 10, Mo.)

BAND CLAMPS AND COUPLINGS. 44-page catalog No. 803 contains full product information on complete line of industrial band clamps, hose clamps, couplings, flanges, and V-band joints for all types of applications. (Write: *Marman Div., Aeroquip Corp.*, Dept. RLC, 11214 Exposition Blvd., Los Angeles 64, Calif.)

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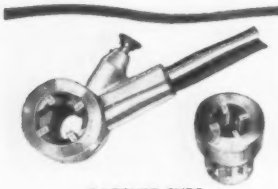

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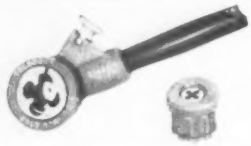

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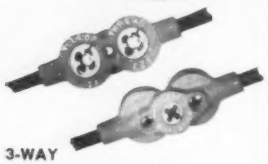

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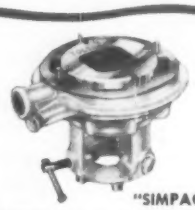

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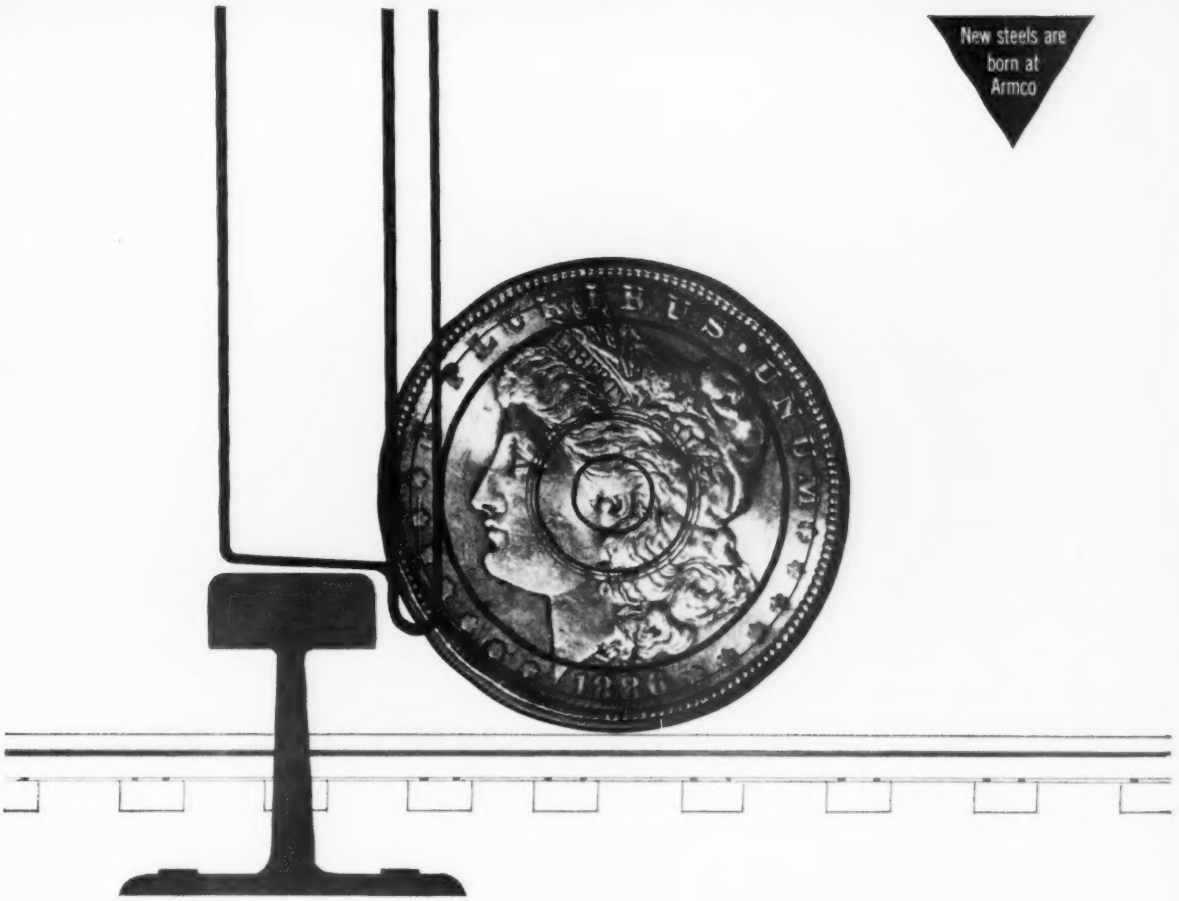

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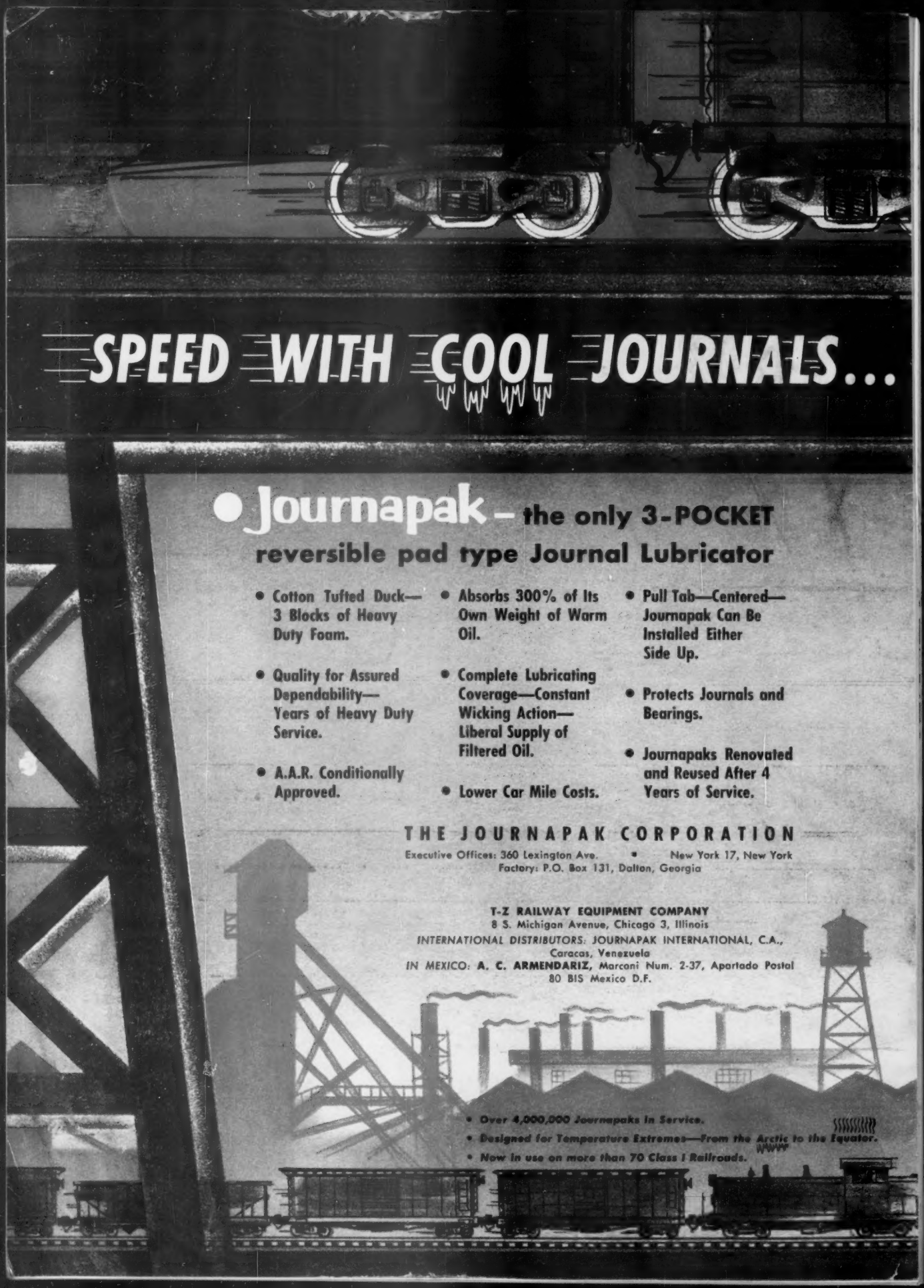
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